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The Canadian Builder

A Practical Paper Devoted to all Branches of the Building Trades

Published monthly by The Commercial Press, Limited, 408 McKinnon Building, Toronto

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The Builder Must Be Convinced

¶ In a country like Canada, where abounding prosperity provides exceptional opportunities for enterprise and aggressiveness and where our cities and towns are growing by leaps and bounds, it is inevitable that in every city and almost every town there should exist a class of master workmen who "build to sell."

¶ It may be one house, a row of houses, a store or any other class of building they erect. All this depends on the opportunities they recognize.

¶ No matter what they build, however, they decide for themselves what materials and equipment will be used throughout—on the walls, the floors, the roof, the verandah, etc.; what heating equipment and what bathroom fixtures will be installed.

¶ The manufacturer who wants to sell equipment for the buildings these men build must convince them regarding the merit of their goods.

¶ The Canadian Builder is primarily a paper for "the man who builds." It is THE medium through which to reach these big buyers.

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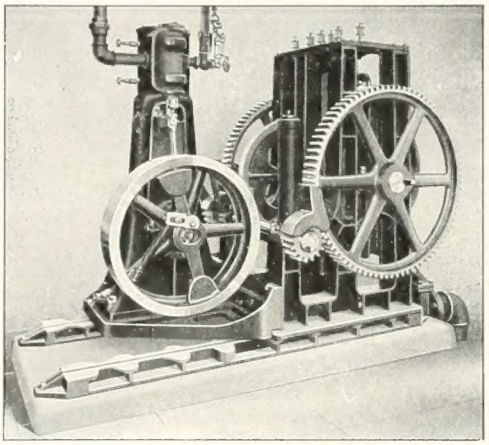

Saves 20 to 80 per cent. of the power consumed by other pumps.

The pump shown in the cut saved one railroad 35 tons of coal per week.

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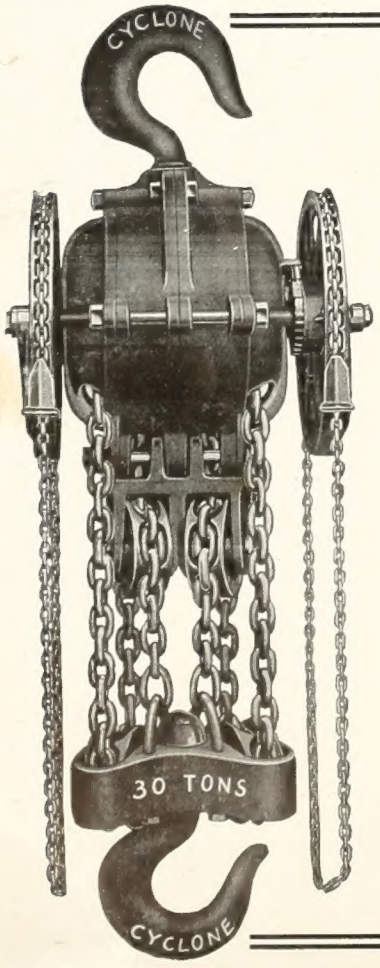

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has but 6 load chains where other hoists of equal or less capacity need 12 and even 24. That is because the CYCLONE eccentric gear is so efficient that with a total pull of only 80 pounds on each hand chain, the full 30 tons can be lifted with only the two pairs of idler sheaves.

This means less dead weight of chain, less friction and quicker hoisting.

There are no overhanging bearings in the CYCLONE, so that even under the full load the frame will not spring and bind the working parts.

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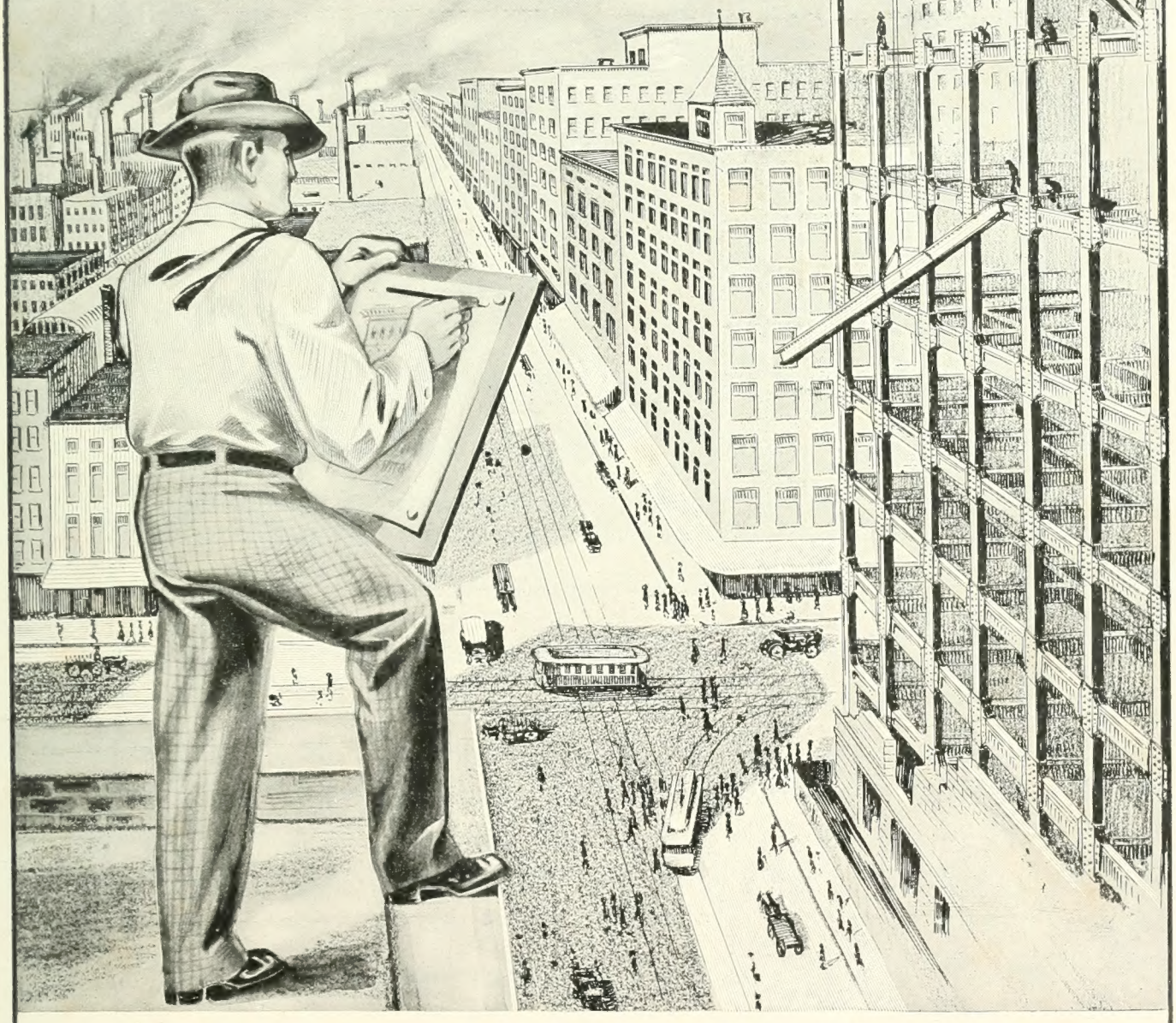

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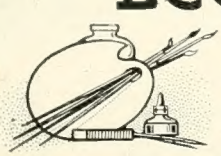

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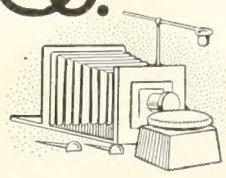

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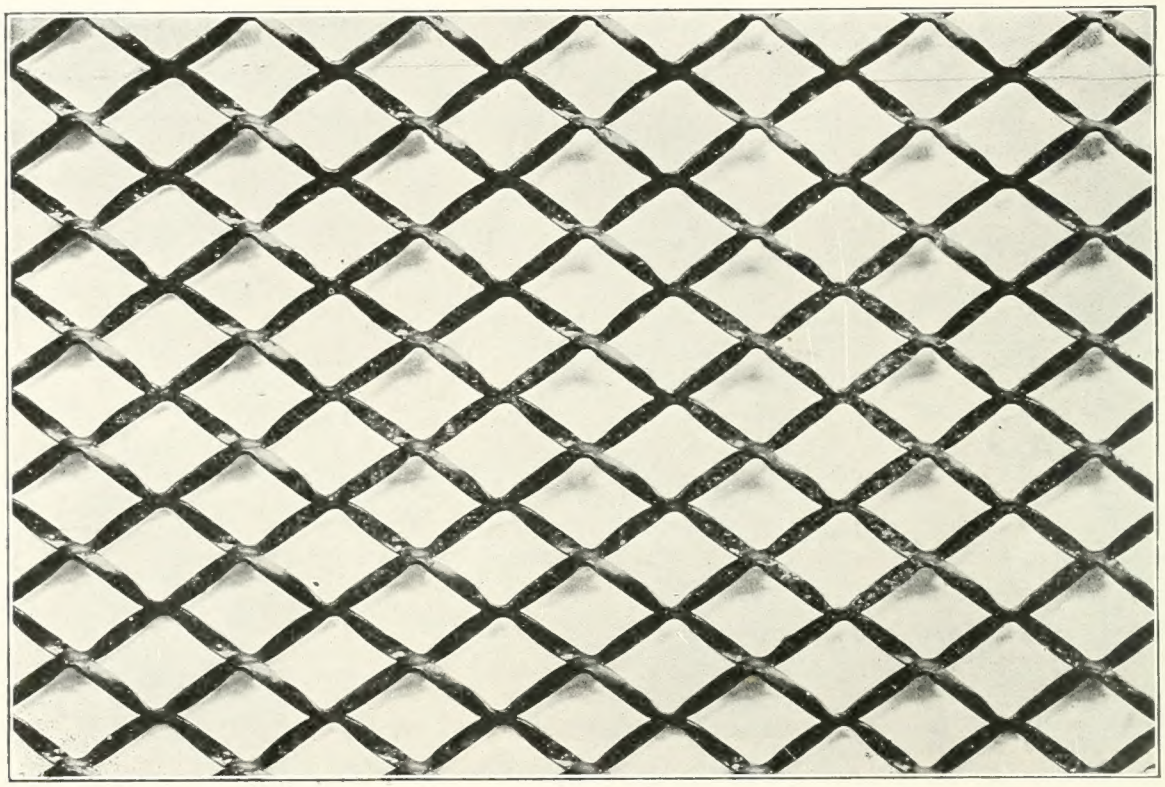

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Notice in the above Photograph how these strands are turned to catch and hold plaster in every direction.

This Lath cannot be applied wrong side out or upside down—equally suitable for wall or ceiling work and readily adaptable to any shape for cornice or beam work.

Sheets, 96 in. by 27 in., (twice ordinary size).

PRICES:

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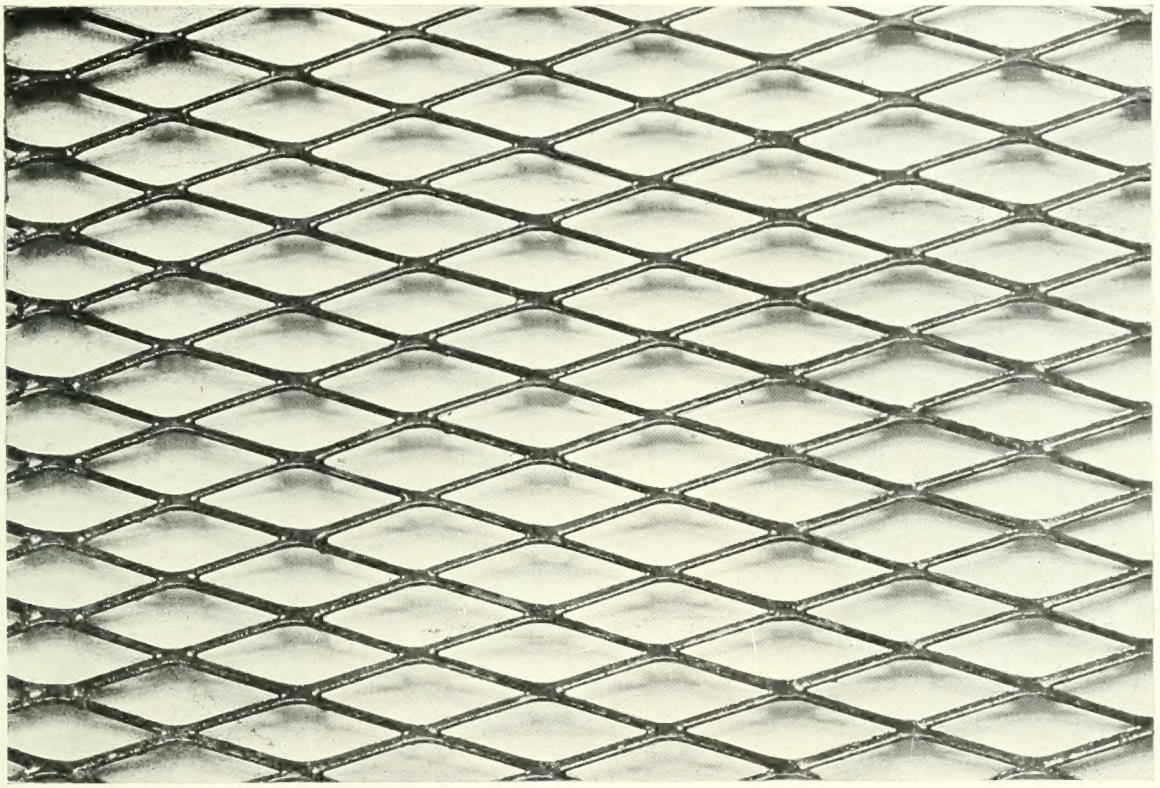

"Steelcrete" Diamond-Mesh Lath

The Old Favorite

"Steelcrete" Diamond-Mesh Lath is a flat, rigid fabric offering an ideal plastering surface.

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Sheets, 96 in. by 30 in.—cut cost of lathing and waste in laps in two.

PRICES:

23 Guage, 15c.; 24 Guage, 13c. per square yard. Prices on sherardized or galvanized lath on request. Catalog "S 5" illustrates "Steelcrete" Lath, Corner Bead, Studding and Furring, etc. Write for it.

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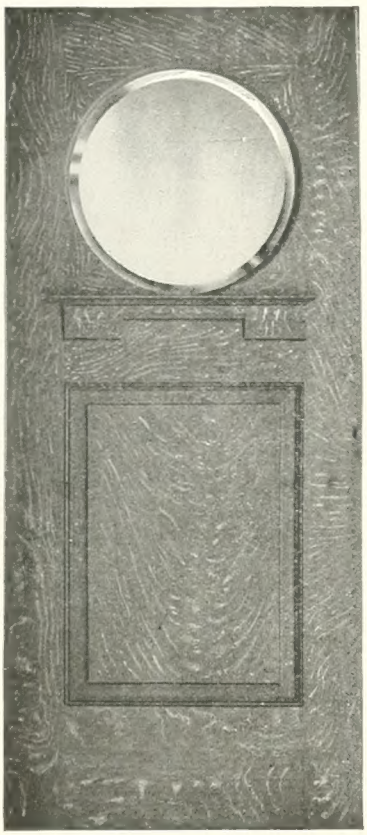
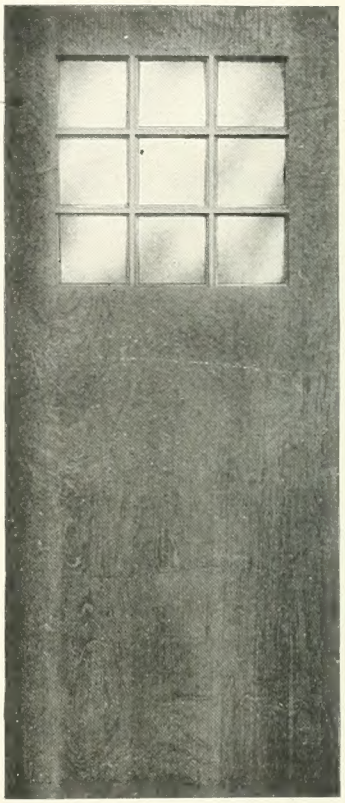


DOORS



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A Look Into the Preparation of Estimates

By W. Fraser

Under this section we propose to take into consideration the various difficulties, inconveniences and expense with which contractors are beset in all departments of the building trade, and to do our best to dissect and probe into any expense which may effect the cost of any work placed in the building. We do not expect our readers to always agree with us. We shall be sorry if they do. What we hope, however, is to provoke some discussion, so that an idea of what may be styled Canadian practice may be outlined.—The Editor.

(*Continued from last issue*)

The specification defines that the footings shall be of concrete, composed of the following proportions, viz.: 1 of approved Portland cement, 2 of good sharp sand, and 4 of clean crushed stone.

We make a diagram of the various footings, as figured and shown on the plans, and number the same for reference.

Nos. 1 and 2 are wall footings and correspond in area with the trenches we took off to receive them. As this will give speed a chance while not impairing accuracy, we will save the brain by simply noting the figures of the trenches, but change the sections to sizes of concrete shown.

No. 3 is also a wall footing (that of the deep cellar), but is formed in two plats. We will allow the same area as the trench, but to save time will average the width of the plats on the section. No. 4, being a column footing, gives no trouble, but No. 5, though a column footing, is formed in two plats, and were we to average them as we did with No. 3, we would be in error, therefore we must take off the different plats separately.

No. 6 is the chimney footing, and being a truncated pyramid, gives some trouble. We will first note the 12-inch square base, and next the sloping portion above by such special memo. as will give us to understand what we are at when we come to figuring out contents. There are various mathematical rules laid down for this purpose, but we will adopt the most simple and the method most easily carried on memory. We will produce the truncated lines to the height of the complete pyramid, and figure out its contents in full. We can see by the figures given that line A measures 3 ft., B 5 ft. and C 5 ft. Then we say, as A is to B, so is C to D. Add D to B, and we have the full height of the pyramid. Then multiply the square of the base by the full height, and divide the product by three (in all cases), which gives the contents of the full pyramid in cubic feet. Proceed with the top portion by squaring twice the length of C; multiply by D and divide by 3. This gives the contents of the top portion, which sum subtracted from total contents leaves the balance as the contents of the truncated portion. It might be worth while to see how we would come out if we simply made an average of the width of the top and bottom of the truncate and mutiplied by its height. Well, we would land with the cubic contents being 845 ft., while by following out the rule laid down the contents are 861 cubic feet, the difference of which in these days of close competition is worth considering. Besides, though we have only one pyramid to deal with in the plan before us, they are largely used as column foundations on a certain class of buildings.

As this finishes taking off the concrete footings, we will figure these out, and then turn in on the thinking out of our price for the same.

The first thing that strikes our view is the proportions 1, 2, 4. We have been reading of late of the stand that has been taken by important professional as well as commercial men against what is held as the exacting code of civic by-laws, and we have no doubt that this proportion of concrete comes under their notice as an extravagant and unnecessary expense saddled on the owner. With that point in view, we feel like approaching the architect and ascertaining from him whether he is peculiarly determined to adhere to these proportions or whether he is disposed to relax into a proportion of more of a business character. In interviewing him, we wlil prepare our ourselves by having some logic ready in a short tabletted form, which is founded on our practical experience.

We have generally found architects open to contractors' practical views. They endeavor to keep themselves abreast of the times by not being "know it alls," and it is with this experience in view that the idea occurs that we should have the courage to approach him with the following tablet:

We will now take off and note

Concrete Foundations

WALL FOOTINGS

(1)	$4 \times 2 \times 70 + 40 \times 2 + 78$		
	$+ 16 \times 2 + 72 + 6 \times 2$		2752
(2)	$3 \times 1^{6} \times 130 + 27 + 17$		783
(3)	3^{6} avg. $\times 2 \times 152 + 137 + 32$		2247
(4)	Col. foots. $3^{6} \times 1^{6} \times 3^{6} \times 20$		368
(5)	$6 \times 1^{6} \times 6 \times 5$		270
	$4^{6} \times 1^{6} \times 4^{6} \times 5$		152
(6)	Chimney base $16 \times 1 \times 16$		256
	Trunc. portion 16 square and 10 square $\times 5$ high		861
	Incl. forms	27	7689
			285

Proportions.

Proportions.	Increase when placed over 1 cu. yd. of stone used.	Loss of bulk when placed. Percentage of total dry materials.	Remarks.
1 Cement. 2 Sand. 4 Stone.	3 cu. ft.	33%	Severely expensive concrete.
1 Cement. 2 Sand. 5 Stone.	Little or no increase if stone is clean.		Apt to be honeycombed in placing.
1 Cement. 3 Sand. 4 Stone.	8½ cu. ft.	24%	Not easily measured by barrows.
1 Cement. 3 Sand. 5 Stone.	5 2/5 cu. ft.	30%	Good concrete.
1 Cement. 2 Sand. 2 Gravel. 3 Stone.	9 cu. ft.	21%	Strength is impaired by gravel.

If the architect should decide on accepting the proportions of 1, 3, 5 instead of 1, 2, 4, we will figure accordingly. But there still are difficulties in the way of straightening things out. We will say that 1, 2½, 5 would be a better proportion, and would not much increase the expense. In these days of speed the old method of measuring by box is behind the times, and we have to resort to the measure by barrow. As a rule, a wheelbarrow, when well filled, will hold 3 cubic feet. A bag of cement we take as 1 cubic foot, and we have no difficulty in measuring 1 to 3, but when we come to supplying the 5 of stone which is to be carried in two barrows, our men are in the habit of filling them, which would be 1. 3, 6, and as we are only human, we do not like hindering them from doing so. Some time it would occur in carrying out 1, 2½, 5, that by filling the barrows it would mean 1, 3, 6.

We must confess that this is how things work out, and while the principles adopted are in our favor, it is not up to us to complain.

There is no other way known to us whereby we may be relieved of the odium of being all the time selfish, except that we should be called upon to use one of those machines that are installed with appliances for regulating the exact proportions of the materials. Though they are used sometimes on street work, it does seem that there is some good reason why they are not used in building operations.

While with an ordinary machine a cubic yard of concrete will cost us from three hours to six hours of a man's time, we have counted the output from one of these machines we mention and found it equal to 1½ hours per yard.

While we are in a thinking mood, just let us think a little more, and it stands right here. We simply want the word "fair" to be used, and we consider that when the architect has ceased to enforce the use of box measurement for good reasons, he should distinctly specify proportions in quantities suitable to the fill of the wheelbarrow.

Then there would be fair competition. Justice would be done to the owner, and our reputation would not be placed at stake.

We will now follow up with some further remarks which have a certain effect on price.

(To be continued in September issue.)

HARDWOOD FLOORING.

Have you ever glanced down the columns of your local paper under the caption of "Residence Property for Sale"? If you have, you must have noticed how owners, investors and real estate dealers feature the most important parts of the construction. If oak flooring is used, they always draw particular attention to that fact. There are good reasons why they do this. Oak flooring is a most important factor when it comes to renting or selling a residence, as there is no other part of the construction that helps more to beautify a home, as its colors are soft, rich and cheerful and tones up a home just as much as furniture. It gives an air of refinement and elegance to a home, whether it be in a humble cottage or a mansion.

An Economical Use of Oak Flooring.

The standard thickness of oak flooring are 13/16 and ⅜ inch thicknesses. The 13/16 inch thickness makes the most substantial floor, and usually is about 35 per cent. more expensive than ⅜ inch. The ⅜ inch oak flooring can be laid over old floors very economically, taking the place of carpets, without in any way interfering with the woodwork of a room. When laid it has the appearance of heavy flooring, and not even an expert to detect its thickness. The highest quality of clear quartered oak flooring ⅜ inch x 2 inches wide can be bought, laid and polished for half the cost of fair quality of carpet, which proves that carpets are an expensive luxury, as compared with oak flooring.

Adaptability of Various Grades.

The following is a general outline of the uses that are generally made of the various grades of oak flooring:

Clear quarter-sawed or first grade.—For high-class residences, hotels, apartment houses and club houses.

Sappy clear quartered or second grade.—An economical substitute where a dark finish is desired. This grade is as durable a floor as the clear grade.

Clear plain sawed or first grade.—For high class residences, hotels, apartment houses, churches and club houses.

Select plain sawed or second grade.—For medium-priced residences, hotels and apartments, schools, office buildings and stores.

No. 1 common or third grade.—For dwellings, tenements, stores, high class factories and manufacturers' buildings.

Factory or fourth grade.—For warehouses, factories and cheap tenements.

CANON OF ETHICS FOR ARCHITECTS.

The following canon of ethics has been adopted by the American Institute of Architects as a general guide to members, and will be recognized as enumerating some of the elementary duties of an architect towards fellow professional men:

It is unprofessional for an architect:

1. To engage, directly or indirectly, in any of the building trades.

2. To guarantee an estimate or contract by bond or otherwise.

3. To accept any commission or substantial service from a contractor or from any interested party than the owner.

4. To advertise.

5. To take part in any competition the terms of which are not in harmony with the principles approved by the institute.

6. To attempt in any way, except as a duly authorized competitor, to secure work for which a competition is in progress.

7. To attempt to influence, either directly or indirectly, the award of a competition in which he is a competitor.

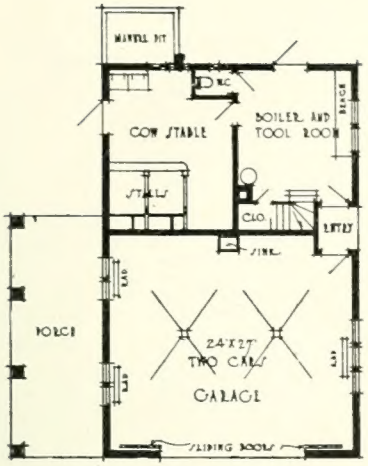
8. To accept the commission to do the work for which a competition has been instituted if he has acted in an advisory capacity either in drawing programme or making award.

9. To injure falsely or maliciously the professional reputation, prospects, or business of a fellow architect.

10. To undertake a commission while the just claim of another architect who has previously undertaken it remains unsatisfied, or until such claim has been referred to arbitration or issue has been joined at law.

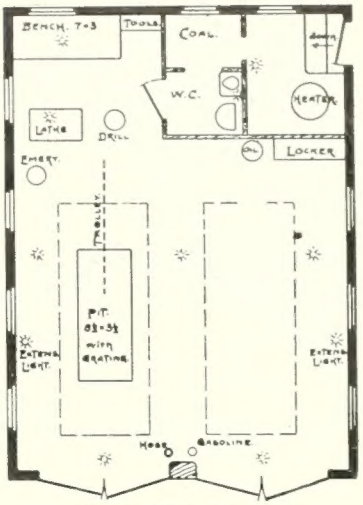
11. To attempt to supplant a fellow architect after definite steps have been taken toward his employment.

12. To compete knowingly with a fellow architect for employment on the basis of professional charges.



By Bailey & Bassett

By Andrew Jaques & Kentoul



By Mr. Toole, the Author

Practical Design for a Private Garage

By Herbert L. Towle, in "Motor"

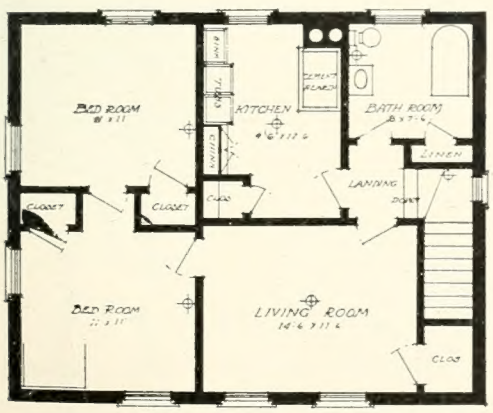
When a garage contains more than two cars a question arises as to the entrance and inside arrangements. Where the winter climate is not severe, undoubtedly the simplest plan is that of an individual pair of doors for each car. In freezing weather, however, a garage so arranged is hard to keep warm, unless the doors open on the south side. The next choice is a single door with a turn-table inside for backing each car into its proper place, which in this case should be crosswise of the entrance, as in a public garage. Failing a turn-table, skids may be used. If the garage houses but two cars it is simplest to give an individual door to each car.

The usefulness of the turn-table has already been indicated. It occupies considerable room, since its diameter must be that of the diagonal wheel base plus an allowance of 6 inches or so for flattening of the tires, and this room cannot be used for any other purpose beyond washing the cars, for which purpose the turn-table pit is, of course, drained. For the one and two-car garage the turn-table is, therefore, a luxury, but with three or more cars it begins to justify itself.

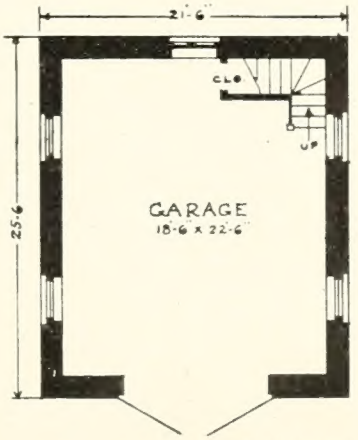
A working pit is a luxury in much the same manner. It is a convenience where much repair work is to be done, and therefore justifies itself where several cars are kept in order.

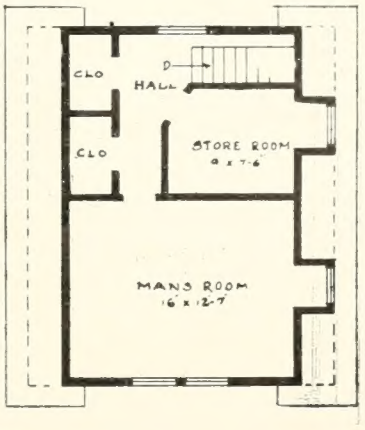
For one and two cars the trundle already mentioned answers sufficiently well. The working pit, like the turn-table, must be drained, and it is advisable not to connect it with the general garage drain, in order to avoid the possibility of an explosion of gasoline vapor in the latter communicating to the pit.

When planning a garage for three or more cars, it is essential to arrange so that the movement of any one car shall not involve disturbing the other cars. The writer has seen garage floor plans otherwise excellent, in which this requirement had been wholly overlooked, with the result that a car coming in from the washing stand might find its way blocked by one or two other cars thus necessitating shifting the latter, and possibly running them outside to do so. In the plans is shown a floor plan with separate washing stand and separate entrance and exit in which the difficulty just mentioned is avoided by use of a turn-table. Any car can be run onto the turn-table, swung around, and run out front foremost, without disturbing any other car. The arrangement shown is limited to four cars. To accommodate a larger number, it would be best to build the garage like a round-house, with a storage room forming a portion of the circle, with a turn-table at the centre. The washing stand could then be combined with the turn-table, or better, per-

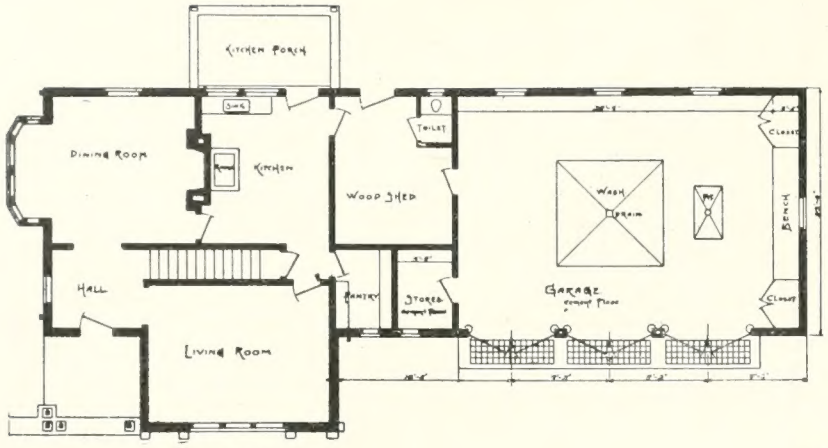


By Paul R. Allen





By F. C. Schermerhorn



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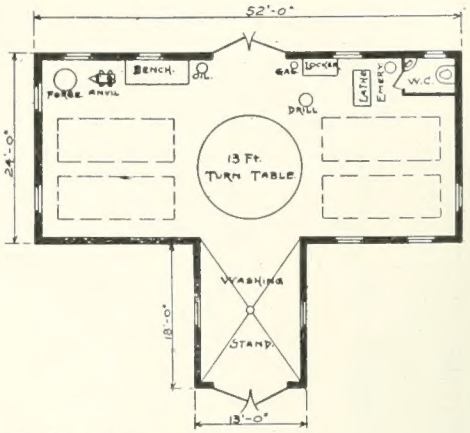


By Mr. Toole, the Author

haps, could be located separately, as in Figure 3, and the machine shop and paint shop could be located one on either side of the washing stand. Another arrangement would be to extend the plan of Figure 3 by adding another turn-table and two additional cars on each side, flanking the central passageway over the turntable. Of course, by using skids the cost of the turntables may be saved, but to handle a car easily on skids requires three men.

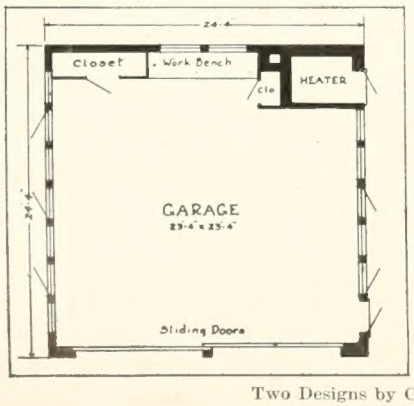
It has already been mentioned that the hot water system of heating is the best adapted to garages. This is partly for the economy of the system, and partly because the garage will not suddenly freeze up, as it might owing to lack of steam if the steam system were used. The hot water is carried through pipes around at least two, and preferably three, sides of the garage. The pipes should be placed as low as possible, and in order to insure circulation, the heater will generally have to be depressed 2 or 3 feet below the floor of the garage, assuming that there is no basement. These small heaters are very economical, and three hods of coal will last a week in average winter weather.

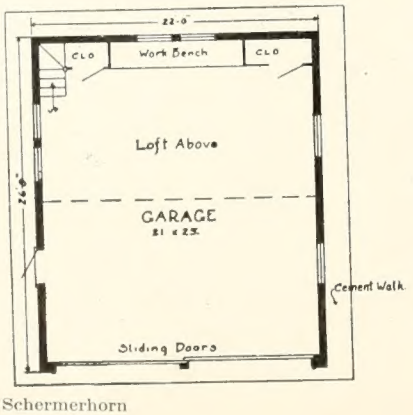
Thus far architectural details of construction have not been mentioned. The available materials are stone, solid concrete, hollow tile, bricks, concrete blocks, stucco, wood and steel, besides, of course, portable houses of wood or wood and canvas.

A highly desirable feature, and one difficult to attain in a small garage, is ability to resist sudden changes in temperature. A small garage, if not carefully planned, may become a furnace or an icebox in a few hours, and neither extreme is good for the car. High temperatures hurt the tires and the paint, and low temperatures sometimes lead to cracked water jackets and leaking radiators. From this point of view perhaps the best material of all is hollow tile, on account of the air spaces contained. Next to this comes a double wall of solid concrete, with an air space between the inner and outer walls. Stone is nearly as good, and may be quite as good if furred and plastered over laths inside. Bricks and concrete blocks are fair. Stucco, either wood or metal, though not absolutely fireproof, is a close approach to it if lathed and plastered inside, and resists temperature changes fairly well. Frame construction the writer condemns as not being fireproof. A portable house, by the way, becomes a permanent house in the eyes of the law, if planted on a permanent foundation of stone, brick or the like. The proper thing is to place it on wood piling, which can be taken up.

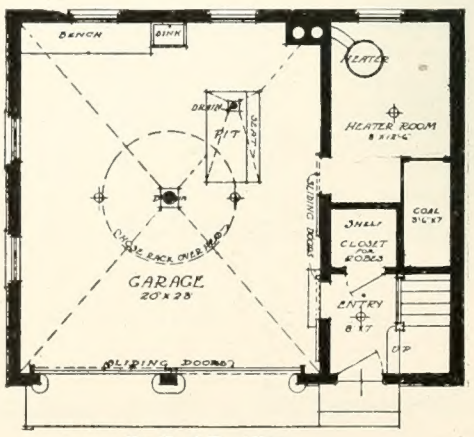
The smaller the garage, the more necessary it is to have approximately weather-proof swinging doors. The writer has devised the arrangement shown in the accompanying sketch, for excluding rain and snow. A strip of canvas nailed to the bottom of the door would approximately serve the purpose instead of the swinging metal or board flap shown in the sketch. Owing to shrinking and swelling of the doors, absolute tightness is not to be expected, but by using weather strips of various sorts it can be approximated.

Whatever the construction otherwise, the floor should be concrete. It may drain to the centre, under each car, or better perhaps, it may drain to a trench molded in the concrete and running all around next to the walls. The chief objection to the centre drain is the possibility of a gasoline explosion in the drain setting fire to the car. The slope should be arranged so as to lead away from the floor about the bench





Two Designs by C. E. Schermerhorn



By P ul R. Allen

and tools. For instance, in the sketches accompanying this article the drain trench may follow the dotted line of the curtain. It has sometimes been suggested that the water from the washing be drained out through the main doors. This is excellent except in winter, when the doors are liable to freeze fast. The better plan is to crown the floor as suggested, drain to right and left, and have the ends of the drains lead into drain openings just inside the door.

The lighting arrangements should give ample illumination both overhead and beneath, without direct sun if the latter can be avoided. Ribbed glass panes are excellent to intercept sunlight. The windows should extend fairly low, i. e., not more than two feet above the floor. If the expense is not too much, a northern skylight is admirable. The electric drop lights should be placed as shown in the sketch plans, one on each side near the motor, another over the bench, another over the lathe, if any, and at least one at the back of the car over the door. Extension sockets for side lights should be provided, at least one for each car.

Since many stables are being remodeled for garages, the foregoing suggestions may readily be extended to these also. A cement floor is desirable in all cases, to minimize the danger of fire. It can be laid on the existing floor by reinforcing the floor beams, if necessary. Additional windows should be cut in as needed, and the interior should be lathed and plastered. If the heater is located in the basement, it should be reached by outside stairs so that there shall be no possibility of heavy gasoline vapor settling into the basement and causing explosions.

ELLIOTT COMBINATION WOODWORKER FOR BUILDERS.

A combination woodworker for builders, carpenters, contractors, patternmakers, millwrights and other woodworkers. Fig. 1 illustrates the Elliott Woodworker with motor attached. The machine is operated by a hand lever, and the carriage slides in planed bed with "V" ways. Bed has radial movement for mitering and trimming at any angle. It has a stroke of 18 inches and 2 inches thick. The saw can be replaced by a dado head for stair routing.

The machine is equipped complete with motor and the following attachments: Rip and cross cut saws, two dado heads, [illegible] x 6 inches, and [illegible] x 6 inch boring chuck, [illegible] inch machine bit, and 4 inch x 1 inch emery wheel.

The motor can be attached to an ordinary incandescent lamp socket, and does away with the necessity for high voltage wiring, transformers, etc., thus making it very convenient for use in any building where electric light is used.

One of the most useful jobs for which the woodworker can be used is the routing of stair stringers. With a ⅞-inch dado head it will rout out stair stringers with the proper wedge room, with two cuts across. When employed as a stair router the construction of this machine permits the operator to keep the work in full view all the time. This is a feature which will appeal forcibly to all practical workmen. It is specially adapted for all kinds of stair work, and can be used with rip or cross cut saw for preparing the threads, cutting risers, wedges, balusters, etc. It can also be used to advantage in window frame work, and will dado ⅞ inch wide by 1¾ inches deep for 2¾-inch sills at a single cut.

Being light and compact, it can be taken right out on the job, and will be found very convenient for all kinds of cross cutting, light ripping and general sawing work.

By means of a 90-degree quadrant work can be cut at any angle. The quadrant is fastened to the work bench by two screws. The saw can be raised or lowered by means of a handscrew for different thicknesses or depth of cut. The mandril is threaded on this side for chucks or dowel heads, and permits of the use of a boring attachment.

The woodworker was designed by Capt. Elliott, and is being manufactured by the Elliott Woodworker Co., 774 Bathurst St., Toronto, for whom the A. R. Williams Machinery Co. are selling agents for Canada. Besides being patented in Canada, a patent has been applied for in the United States.

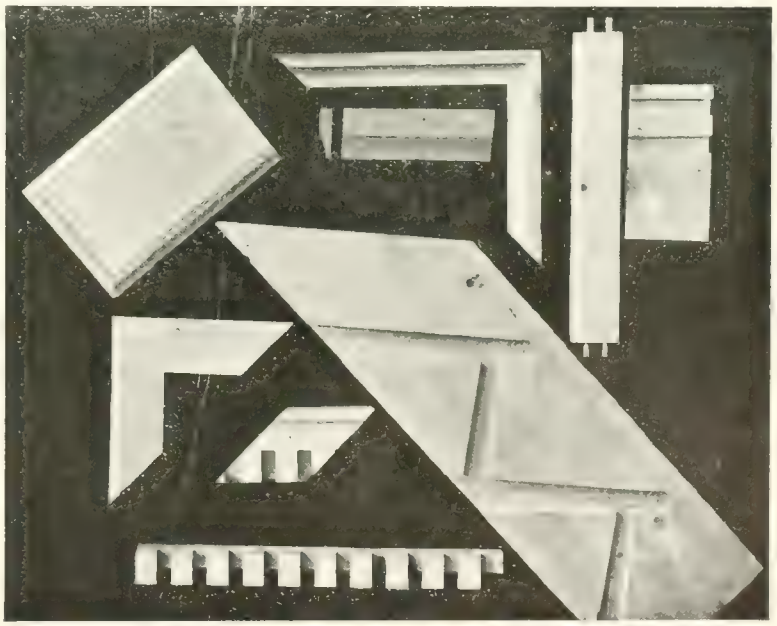


Fig. 2, above, shows the wide variety of work that can be done on an Elliott Woodworker.

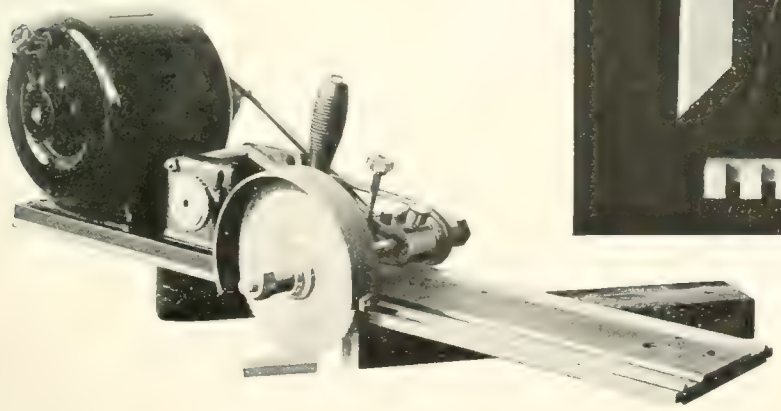


Fig. 1, below, shows the Elliott Woodworker with motor attached. The saw can be replaced by a dado head for chair routing.

Temporary Timbering in Concrete and Terra Cotta Construction

By Owen B. Maginnis

The article below, from the Building Age, will prove useful to builders who desire to take contracts for concrete and terra cotta construction

In the construction of buildings in which concrete or terra cotta is largely used it becomes necessary to provide some form of framing to support for a short time the constituent materials and to act as guides for placing and regulating their exact position. This is generally accomplished through the medium of timber forms, or "false work," as it is sometimes termed. As an illustration we will take the matter of "Bucks," which, though they seem a comparatively simple detail, are yet one of the important and indispensable auxiliaries to work of this class. Observe, for example, Fig. 1, which illustrates the timbering for a doorway 3 feet in width and 7 feet in height. It will be seen that it consists of two side studs or uprights of spruce timber 3 inches thick and 4 inches in width, the latter dimension being the same as the thickness of the partition blocks which measure 9 x 12 inches and are 4 inches thick. This frame is topped by a head timber of the same size, intended to temporarily support a lintel spanning the opening.

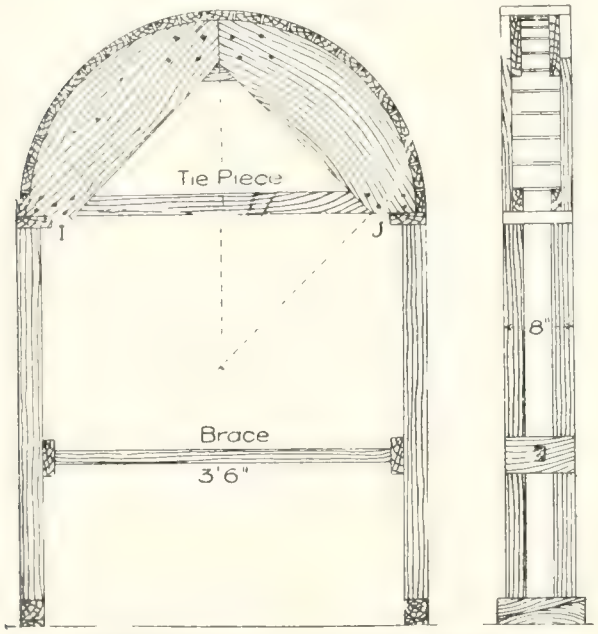


Fig. 1. Elevation and Section of "Centering" for Semi Circular Opening.

In order to maintain the blocks in true position both longitudinally and transversely they are set in grooved timbers, as shown by the plan in Fig. 1, or they have ⅞-inch strips nailed on the edges and projecting 1 inch so as to form grooves to hold the terra cotta fireproof blocks and "grounds" for the plastering. The head piece spanning the opening must be similarly formed, if acting as a lintel, always allowing for the key block, on which the whole stability of the lintel depends.

Perhaps, however, the opening may be topped by a curved head or one which is part of an arc of a circle. In this case it will be necessary to ascertain the angle of the shewbacks, and to do this divide the width of the opening into two parts and locate the centre as for the arc.

For a semi-circular opening of moderate width it is usual to construct the centering or form after the manner indicated in Fig. 1, which represents an elevation and also a cross section. The first important step is the measurements, and it cannot be too strongly emphasized at this point that these measurements must be accurate. The four bucks, studs or uprights, as they may be termed, must be sawn to the height of the spring line I-J, less the thickness of the tie battens at the center and the wedges at the foot. Assuming that the distance to this line is 6 feet then each upright will be 5 feet 9½ inches—allowing 1 inch for battens and 1½ inches for wedges.

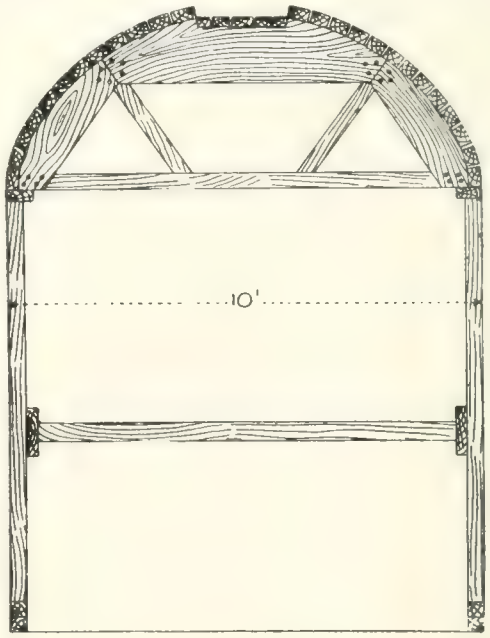


Fig. 2. An Elliptical "Form" for a Wide Span.

In setting, the top ends must be level across with an accurate spirit level, as there may perhaps exist inequalities in the floor levels. In the same way the measurements for the lengths of the horizontal braces cut in between to keep the bucks or uprights from opening or springing must be made. This may be done by deducting the thickness or measuring the distance between, with two laths, holding the two with both hands and then sliding one lath upon the other until the end of each touches an upright.

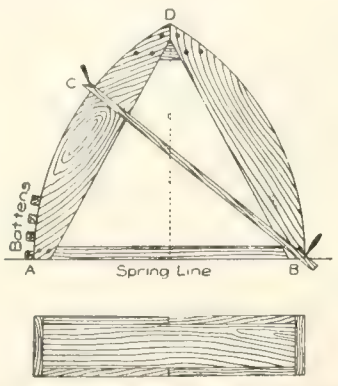


Fig. 3. Method of Constructing a Simple Gothic "Centre.

Another method of building a semi-circular center or "form" for a span, using two or more frames built up in sections of three pieces each and battened together with strips long enough to equal the thickness of the concrete or terra cotta wall. The frames are spaced about 4 inches, 6 inches, or 8 inches apart, according to the weight of the material to be carried.

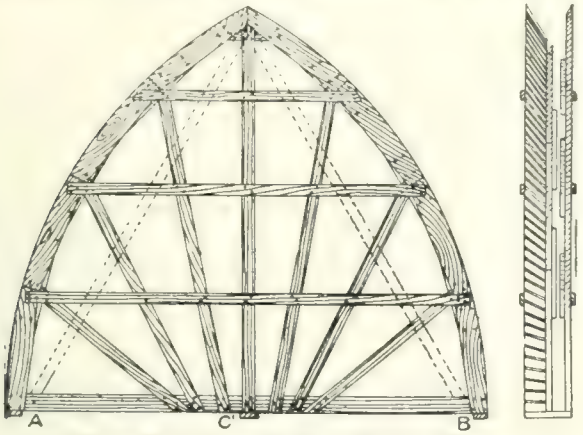


Fig. 4. Elevation and Section of Gothic "Centre" for a 20-ft. Span.

Fig. 2 represents an elliptical form cut out or sunk.

Most of these small arches in building construction are made by carpenters and builders from guesswork or practical experience. In engineering work the designers generally designate the forms, materials and sizes of the false work and centering, but in architecture and building it is, as a rule, left to the builders, for their best judgment and execution.

Boards for concrete "forms" can follow the curvature of the heads or be straight, provided they be wide enough to exceed the arch rings.

The views presented in Figs. 3 and 4 represent Gothic forms or centers, the first being comparatively simple.

The timber A-B, in compression, must be placed absolutely level with the ends sawn to the lines radiating to the center G. The timbers A-C and B-D must then be cut and set, and afterwards the center H-D constructed as shown.

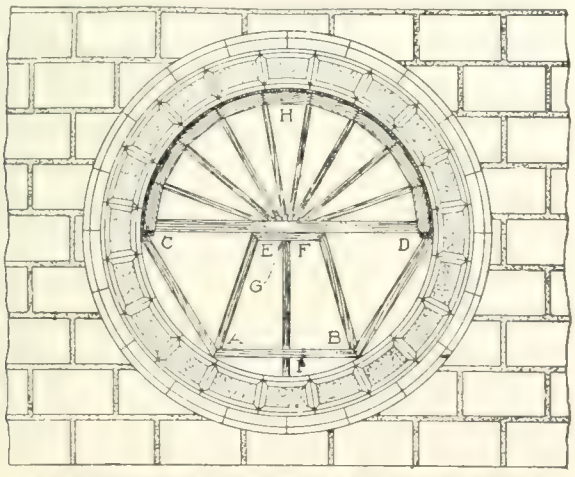


Fig. 5. Temporary Timbering for a Full Circular Window Piercing a Thick Wall.

For additional strength the vertical stud G-I can be inserted. Care must be taken that the invert has become entirely stable or has "set" before the superstructure is commenced.

Referring to Fig. 4, which represents the framework, or center, for a 20-foot span, the battens A and B rest on the topmost plates of the supporting columns, which are assumed to be placed 20 feet between centers. The soffit is beveled to a V-shape, as shown by the vertical section. In a case which the writer has in mind there were three of these forms placed 12 inches apart, the center one following the angle and being one-half less in height than that shown.

In Fig. 5 the reader will perceive the proper method of constructing a form of temporary timbering for concrete or terra cotta blocks for a full circular window, piercing a very thick wall. This framework ostensibly is intended to carry the semi-circular work above the diameter or center spring line C-D. The invert below on the continuation of the soffit line C-A-B-D has been already made and set to the contour represented and placed in position in a full ashlar wall.

What may be regarded as the best methods of temporarily supporting flat arches of terra cotta or concrete between floor beams and, when very deep, are best slung with hooks and clips, is represented in Fig 6, the clip being shown at the left. These clips insure a rapid placing and removal of the forms; do not trespass on the work, and are—if the clips be slotted at X—adjustable to different widths of beam flanges Two other methods of supporting flat arches between floor beams are shown in Fig. 7.

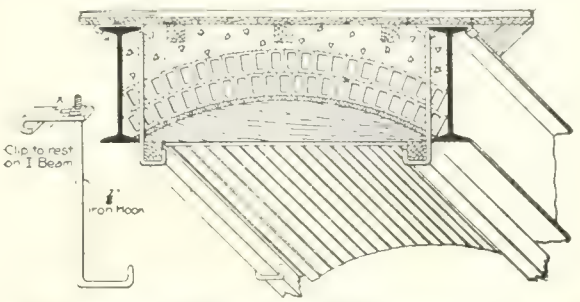


Fig. 6. Method of Supporting Flat Arches Between Floor Beams When Very Deep, with View of Clips and Hook Used for the Purpose.

In the construction of all temporary timbering in building construction safety is, of course, the most important factor, so the forms must be of the best mechanical design in order not only to insure the safety of the men working on or around it, but to guarantee the positive permanence of the completed work. The timbers must be ample in size and at least three times as strong as necessary. They must also be properly placed, especially when they are in compression. All poor material should be thrown aside, the nailing should be thoroughly done and the work executed by skilled, conscientious and reliable mechanics. It should always be directed by a foreman or superintendent fully experienced in this special branch of building and who should make sure it is fully adequate for the purpose for which it is intended before being loaded. If these measures were adopted there would be far less records of accidents or collapses.

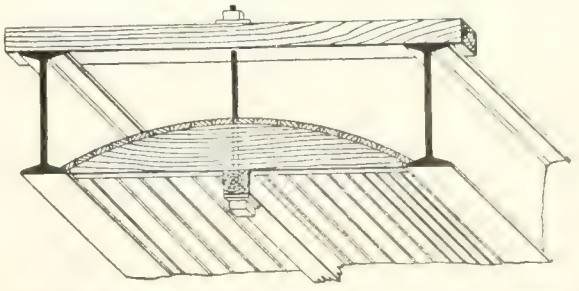


Fig. 7. Two Methods of Temporarily Supporting Flat Arches of Concrete or Terra Cotta Between Floor Beams.

HEATING, LIGHTING, AND PLUMBING

Boilers, Radiators, Furnaces, Lighting Fixtures, Bathroom Equipment, Hot Water Boilers, Kitchen Sinks, Laundry Tubs, etc.

Underlying Principles in Plumbing and Heating Work*

By J. J. Cosgrave

Every person owes something to the calling which has given him a living the greater part of his life, and in no better way can that debt be paid than by trying to add something to the sum total of the knowledge of the craft, which will leave it better off than before. It is recognition of this fact which has led me to accept the invitation of the chairman of your committee on papers, and thereby try to cancel my debt to the plumbing and heating trades by calling attention to certain principles of construction which have been half realized but never fully understood before. I claim no credit for the facts I am about to lay before you other than having collected them and assembled them in their proper order. My attention would probably never have been attracted to the problem had it not been for hundreds of letters from architects in all parts of the country, asking for assistance, which put up to me the study of the various movements in buildings.

Having in the course of that study unearthed many facts of interest and importance, I herewith unburden myself of them to you as the ones most vitally interested, that your association may publish in your proceedings, and pass on by word of mouth, the new element to be considered hereafter in all plumbing and heating installations.

It was Caleb W. Durham, C.E., so far as I can find out, who first realized the necessity for installing the drainage system so it would be free and independent of all structural parts of the building. The Durham system, now modified and known as the wrought pipe system of drainage, we still have in practice, but the principal feature of that system of installation was never fully realized. To most of us the recessed drainage fittings were the principal element of the letters patent Mr. Durham took out about 1880. As a matter of fact, that was but an incident in the system, and the principal element which has all these years been overlooked was the supporting of the soil waste and vent stacks and branches so that walls and floors could shrink or settle, stacks settle, swing, vibrate or sway, but the plumbing fixtures and their connections would be undamaged.

To the inventor of that system of plumbing the necessity for it was so obvious that he failed to point it out to others. He could not realize that without study or instruction others could not see as clearly as he did what had come to him as a result of years of patient study and research; so the result is the good he hoped to accomplish has been deferred for thirty-one years, and he must now be conceded to have been that much ahead of his time.

Perhaps the principal factor in starting me on a study of the settlement of buildings was a letter received about seven years ago from one of the foremost sanitary engineers in America, Mr. Albert Webster, who, from him large practice in New York, preparing plumbing plans and specifications, has had a world of experience in skyscraper types of buildings. In a personal communication to me he pointed out that while special provision need seldom be made for expansion and contraction of soil waste and vent stacks, that provision should be made to protect them and the fixture branches from damage from settlements of the buildings or stacks, or shrinkage of the timbers in frame construction floors. He had seen so many failures in that respect, where 4 and 5-inch branches were broken and closet connections torn apart, that he was forced to the same conclusion arrived at by Caleb Durham 25 years previously.

About this time scores of letters were received from architects calling my attention to the pulling apart of closet bends and the breaking of fixture branches, wanting to know the cause and how to prevent repetitions of the damage. The result of seven years' study called forth by those several incidents I will now give to you in as brief space as possible, together with suggested preventive measures.

When we look at a large building rising story above story for ten to thirty floors, it seems solid as the Rock of Gibraltar. As a matter of fact, however, all heavily loaded buildings erected settle more or less, generally more, unless their footings have been carried down to bed rock. In Chicago there are hundreds and hundreds of buildings which have settled from 3 inches to 5 inches, due to the compressibility of the soil. Architects and engineers knowing the danger of damage from settlements, try in all possible ways to provide against it. For instance, the Great Northern Hotel and a number of others are at the present time, and have been since completion partially carried on jacks, and are periodically levelled up as settlement occurs. Settlement is such a big factor in tall buildings that it seems strange it should have been overlooked in plumbing and heating design.

Just compare it with the expansion and contraction of steam pipes. A steam riser 100 feet long installed during ordinary weather, when the temperature is around 64 degrees Fahrenheit, then heated to 215 degrees Fahrenheit, which would represent a pound or so of pressure, would increase in length 1.12 inches, all of which is provided for by hanging the riser near the centre of its length so it can expand both up and down, thereby keeping the greatest movement of the pipe down to but little over half an inch; and the radiator connections are made with swing joints to allow for such slight movements. But in the same building the entire structure might settle 5 inches, or ten times the movement that takes place in the steam riser, and no provision whatsoever is made for this greater movement, while delicate fixtures of earthenware and porcelain enamel are connected up rigidly without any provision for the settlement, and connected up with pipes many times larger than the flexible pipes used to connect up cast-iron radiators.

The effect of settlement of soil, waste and vent stacks and the preventive measures to adopt have been so well stated by another who has seen the light, Mr. Henry D. McCormack, C.E., in a series of articles he is

*Paper presented at the National Convention of Master Plumbers.

now running in Domestic Engineering, under the title of "A Uniform and National Plumbing Code," that I quote freely the following paragraphs from his article:

"So far as the settlement is concerned, it does not affect the stability of the building so long as the settlement is uniform. But it does affect the piping if not properly supported. Take for example the case of the New York plumbing code, which requires the stacks to start from brick piers located in the cellars. Unless these piers are nicely proportioned to carry exactly the same weight per amount of area as the foundation walls, a condition that is not likely to be carried out, then the building will settle naturally, while the stacks will remain in place supported by the piers, unless forced down by structural parts of the building pressing on the branches. If the stacks and drains are forced down by pressure of the settling building, there is no question but that damage will inevitably result, and in this case, as in all others, the ounce of prevention, that is to rough-in and support your pipes so that they will move uniformly together, or else be entirely independent of each other, is the best plan to pursue, and far better than the pound of cure.

If the horizontal system of drains in the building is run above the floor line of the cellar, the stacks can be supported where they turn up by means of strong iron hangers, designed to carry the entire weight of the stack and branches, attached to I-beams overhead. Or when the stacks turn up close to the bearing wall, they can rest on corbels, built into the walls; then when a settlement occurs the entire system of piping, both horizontal and vertical, will move with the building properly, and when the building finally comes to rest at the lower level the parts will still retain relative positions.

The foregoing is only when the settlement of the building is uniform throughout the entire extent of the foundation walls. When the settlement is unequal, as is generally the case, as is attested by cracks of plastered walls and tile flooring in so many buildings, then while there is a general downward tendency, the movement is not uniform throughout the system. It is to provide for just such contingencies that experienced plumbers on big work provide swing joints at all floors of the buildings, where batteries of fixtures are to be taken off, and interpose a number of fittings so that when the inevitable settlement occurs there will be sufficient "spring" or "give" to the piping to take up the movement, without breaking the stocks or fixtures. That is one provision which ought to be taken care of in a plumbing code, and so far as the writer knows is entirely overlooked.

"When the horizontal system of drains is bedded in the earth beneath the cellar floor, on the other hand, it occupies the same position in respect to settlement as when the stacks are supported on brick or concrete piers. When the settlement of from three to five inches occurs, it is the walls, floors and general structure of the building which sink, while the cellar floor and pipes embedded therein retain their original elevations. It is obvious, therefore, that in such a case something must give, or the building could not settle, and in every case it is the soil stacks and branches.

The Support of Stacks.

Another point to consider is the way the stacks are supported along their vertical length. There is only one logical way to do this, and that is to support the stacks at intervals, say at each tier of beams, on rests which will hold the pipe in place, support it from settling, but allow it perfect freedom to move upward if necessary to do so, due to a settlement of the building without a corresponding settlement of the drainage system. Then all the fixture branches should be kept clear of structural parts of the building, and be so roughed-in that as the stacks are raised relative to the building, by a settlement of the walls and floors, the branches would adjust themselves automatically to the new condition of affairs so that no damage would result.

What we want to require, then, in the new code is a system of supports for the vertical pipes which will hold the stacks firmly sidewise, will not allow them to settle, but will allow them freely to move upward in the hangers. Supports for the horizontal piping in the cellar or basement, when not buried in the ground, which will insure the system of piping and the building settling together, and, where the system of horizontal piping is buried in the ground, a complete detachment from the building walls proper, so that in case of settlement the pipes will simply move upward in their support at the various floors. Lastly, roughing-in of the branches to batteries of closets and other fixtures in such a manner as to provide for a raising or lowering of the stacks without damage or injury to the piping or fixtures."

So far we have considered only the effect caused by the settlement of the building itself when the stacks either retained their original positions or were carried down by the superstructure. There is the opposite condition to be considered, however, where the stacks are insufficiently supported and settle of their own weight. The remedy for this is, of course not the perfectly rigid heretofore attempted in plumbing construction, but on the contrary, perfect flexibility coupled with adequate supports for the stacks. The method adopted to prevent damage from settlement of the building will be found to afford protection likewise in case of settlement of the stacks. The logical method of attacking the problem would be, of course, to prevent buildings or stacks from settling; but since that cannot be done, we must recognize and realize the condition which confronts us, and provide flexibility to the system to compensate for the movements when they occur; and this flexibility for plumbing systems is the main element so long lacking, and which must be supplied in practice.

Large buildings have only been touched upon so far. Ninety-seven per cent. of the buildings erected, however, are of frame floor construction, in which wooden joists of from 12 inches to 20 inches are used. These buildings, like the larger one previously mentioned, all settle, but the settlement in these smaller buildings will average only from one to three inches.

But there is another movement which must be taken into consideration in wood floor construction buildings, and that is shrinkage, a not insignificant movement, as you will see.

Shrinkage of Timbers.

The Department of Agriculture, Division of Forestry, has been studying the shrinkage of timbers, and in Bulletin 10 give the result of their investigations. From this document I find that the hard pines, tamaracks, yews and other woods, commonly used for floor beams, shrink upon drying 4 per cent. The hard woods shrink more than this, varying all the way from 6 to 10 per cent. At the rate of 4 per cent. an average floor joist 12 inches deep would shrink upon drying 0.48, or practically half an inch, while an 18-inch joist would shrink 0.72, or approximately three-quarters of an inch.

Just compare this heretofore ignored shrinkage with the expansion of a steam riser 100 feet long supported in the middle. The steam pipe, as previously pointed out, would expand slightly more than half an inch up and down, or less than the shrinkage of one 18-inch joist! I have seen, and no doubt you all have, radiators held off the floor at the inlet end by the pipe connection. There being no appreciable expansion of pipe for the short lengths used, the fitters had provided no swing connections; then, when the inevitable shrinkage occurred, the radiators (one pipe connection) were held up at the inlet end enough to trap the radiator and cause a rattling, snapping sound. Most connections to first-floor radiators are made in this way without allowing for contraction and expansion, which is seldom more than 0.05 of an inch; but while contraction for that small distance is infinitesimal, shrinkage is a factor not to be ignored, for in the average building it can be assumed to be between ½ and ¾ inch for each tier of floor beams.

But it is not the steam radiators alone that are affected by the shrinkage of floor beams. When the average building is completed the floor beams are not only green, but they are saturated and swollen with rain water and moistened from plastering. While in this condition the floors are laid and closets are set in place. With the inevitable shrinkage which comes, the floors fall away from the fixtures, which are left without support to be broken at the floor flange, or else the weight of the fixture when in use forces down the entire roughing at the expense of the joints or bends. If iron bends are used, the plumber must be called in when the joints are through shrinking to lower the connection.

It is not necessary at this time to go further into the matter. All that I wish to do is point out to your association and emphasize the importance of settlements and shrinkage in buildings and the necessity for providing flexibility to take care of the movements. This flexibility can be provided as in the case of steam piping, where the movement is less, by means of swing joints, or any other means that are sanitary. Once the trade realizes that floor joists shrink in 12 inches more than steam pipes expand in 50 feet, that buildings settle into the soil more than steam pipes expand in four hundred feet, and that rain leaders and soil stacks settle from their own weight enough to tear apart fixture connections, the means of overcoming these various movements can very safely be left to their ingenuity.

ROOFING AND METAL WORKING

Asbestos, Cedar, Metal and Slate Roofings, Skylights, Cornices, Metal Walls and Ceilings, Expanded Metal, Ornamental Iron and Brass Work, Fireproof Doors and Windows, Galvanized Iron Work

METHODS OF APPLYING VARIOUS ROOFINGS TO CONCRETE BUILDINGS.

By Jens C. Peterson, in Concrete

The application of suitable roofs to concrete buildings should not be carelessly handled nor should it be done by inexperienced men.

The simplest form of construction and that most commonly used is illustrated in Fig. 1. This consists of the ordinary concrete block wall, on the top of which is bedded a plate held in position by bolts or ½-inch rods, usually placed at each corner and angle, and spaced at distances of from 6 to 10 feet. On top of this plate are placed the ceiling joists, which may be varied according to conditions. Sometimes when the attic is to be used, these joists must be heavier than when they simply form a ceiling for the rooms below. On top of these joists is placed the ordinary 2 x 4-inch wall plate on which the rafters are notched, as shown by the detailed drawings. These rafters are then covered with ⅞-inch sheathing and the cornice and shingling are done in the usual manner.

Fig. 2 illustrates a tile roof for a concrete block building, the construction being practically the same as for the shingle roof except in the omission of the bolts which hold the wall plate. This style of roof can be used where a tile covering is desired or for concrete or asbestos shingles. A portion of the drawing shows the elevation of the dormer. The balance of the drawing is in cross section.

Fig. 3 illustrates a roof construction of 2-inch x 4-inch rafters and shingle, slate, asbestos shingle, etc., on a concrete, brick-veneered building, a 2-inch x 4-inch studding being placed 16 inches on centres as usual, building paper, and the brick veneering or concrete block laid across against this paper.

A 2-inch x 8-inch wall plate covers the top of the veneering and is spiked to the top of the studding, over which the rafters are placed as usual.

Fig. 4 illustrates a reinforced concrete roof suitable for tile, slate, concrete shingles, composition or patented waterproofing. The style and size of the projection may be varied to suit conditions.

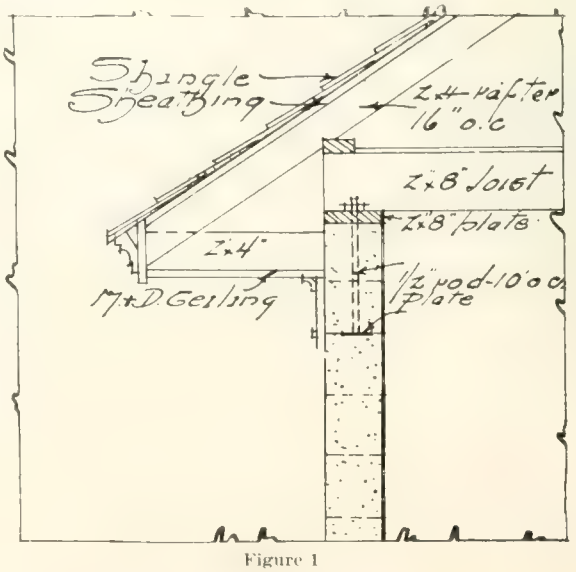


Figure 1

The roof coverings of concrete buildings, whether and covered with sheathing, over which is placed heavy they be of concrete block or brick or of monolithic construction, may be of several kinds.

Wood shingle roofs are the most common for the smaller buildings, and they make the poorest kind of a roof that can be put on any kind of building.

Tin shingles can be laid on the matched and dressed sheathed roofs in the usual manner, so can concrete shingles, asbestos shingles and slate. The width to the weather in each of the above cases depends somewhat

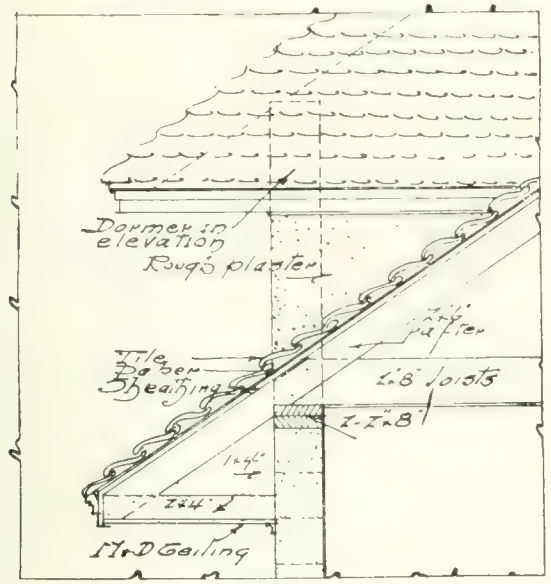


Figure 2

on the length of the shingle used and on the pitch of the roof.

A concrete building which is to be covered with tile may have for the roof rafters of 2-inch x 6-inch material, placed 16 inches on centres, or heavier material, depending of course upon the length of the span between the plate and the purlins or ridge.

When concrete shingle or tile roofs are used the sheathing may either be laid close or composed of strips placed at uniform distances to accommodate the nailing of the top of the concrete shingle, tile or slate. With this class of construction most builders are already familiar.

When it is necessary to place a burlap, tile or composition roof over concrete roof slabs a different method of operation is absolutely necessary.

Covering Flat Roofs.

For a tile roof over concrete it is necessary that strips of wood, previously saturated with pitch or coal tar, shall be embedded crosswise or parallel to the eaves at regular intervals to accommodate the nailing of the top or edge of each successive course of tile.

It might be possible to cover the concrete roof slabs with a porous book tile bedded in cement and laid flat and the nails which hold the roof driven into this porous book tile.

The coverings of flat roofs and decks is another problem, and the methods of preparing for them may be as diversified as conditions necessitate and suggest. The writer, in one instance, had an absolutely flat roof, necessary because of the intention of the owners to add five stories to the height of the building at a later time. The last floor to be placed, being absolutely level, had to be covered with some cheap form of construction in order to get a water shed or drain from this flat roof surface, which could be removed easily when the building should be built higher.

The size of the building was 75 x 100 feet, and the pitch for the roof was obtained by spreading a weak cinder concrete over the entire area. This cinder concrete was moulded into ridges, and was 1 foot deep at the highest part and pitched to the downspouts. Over this cinder concrete was placed the ordinary composition roofing in the usual manner.

Burlap and Felt Roofs.

For a felt, pitch and gravel or slag roof over concrete the following specification is applicable where the roof deck is of concrete.

On the clean and dry concrete surface, which should be free from small holes, pockets, tool marks and projecting sharp stones or gravel (although this concrete surface should not be troweled), there shall first be applied a brush coat of pitch, put on hot and thin enough to penetrate the pores and recesses in the concrete, forming an anchorage for the roof coating. After this first coating has been allowed to harden, there shall be applied with a mop a medium heavy coating of pitch which has been heated to a temperature of 450 degrees F., and while this material is still hot there shall be applied a layer of 8-ounce open-mesh burlap, all carefully laid down and free from folds and pockets and with a lap of at least 3 inches on the edges.

The surface of the burlap shall then be heavily swabbed with pitch, and shall be thoroughly saturated and bonded through the burlap to the first coating of roofing cement below, and while this material is still hot there shall be introduced one ply of 15-pound asphalt felt carefully laid down, free from folds and pockets, and with a lap of at least 3 inches.

The surface of this felt shall then be heavily swabbed as before and a second ply of asphalt felt laid in the same manner as before. The surface of this felt shall then receive a heavy pouring coat of pitch, which shall be thoroughly and evenly distributed with mops, and while this material is still hot it shall be given a heavy finish coat of washed roofing gravel.

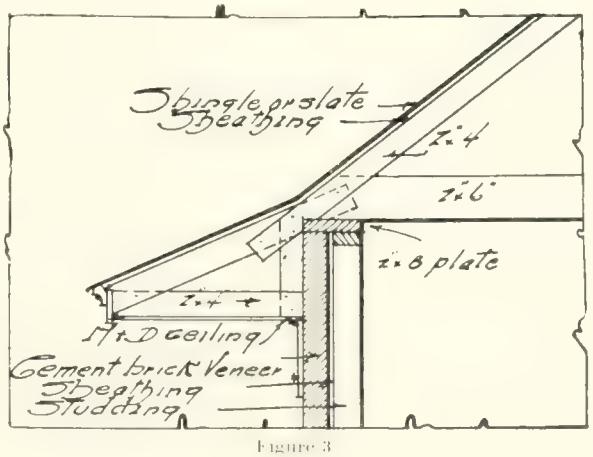


Figure 3

The roof will then consist of one-ply of burlap and two-ply felt, all thoroughly saturated and bonded with each other and to the concrete with roofing pitch.

The flashing shall be carefully done and counter-flashed around all parapet walls, chimneys, ventilators, scuttle holes and other projections, particular care being taken to secure a tight job around branch outlets and between spouts and gutters.

The roofing cement or pitch shall be 99 per cent. pure bitumen, free from any odor or taste and unaf-

fected by exposure for one year to 25 per cent. solution of sulphuric acid, muriatic acid, caustic soda or saturated solution of salt. The pitch, when maintained at a temperature of 300 degrees F. for seven hours, shall not volatilize more than 10 per cent. The material shall have a melting point of 220 degrees F., and shall not flow or creep on a vertical wall under the influence of the summer heat.

The above specification will require about 150 pounds of roofing cement per 100 square feet. The cost of such a roof will be about $4.50 per square.

Fig. 5 illustrates the Barrett specification for felt, pitch and gravel or slag roof over concrete. One-half of this detail drawing is for a three-ply composition roof and the other for a two-ply composition roof, and this specification is applicable where the roof deck is of concrete, which must be smooth and previously graded to outlets or gutters, and should not be used where the roof incline exceeds 3 inches to the foot, unless nailing strips are provided.

Under this specification, first coat the concrete uniformly with hot specification pitch. Second, lap two plies of specification tarred felt weighing 14 to 16 pounds per 100 square feet, lapping each sheet 17 inches over preceding one, mopping with pitch the full 17 inches on each sheet, so that in no place shall felt touch felt. Third, coat the entire surface uniformly with pitch. Fourth, lay three plies of tarred felt, lapping each sheet 22 inches over the preceding one, mopping with pitch the full 22 inches on each sheet, so that in no place shall felt touch felt. Fifth, spread over the entire surface a uniform coating of pitch, in which, while hot, embed not less than 400 pounds of

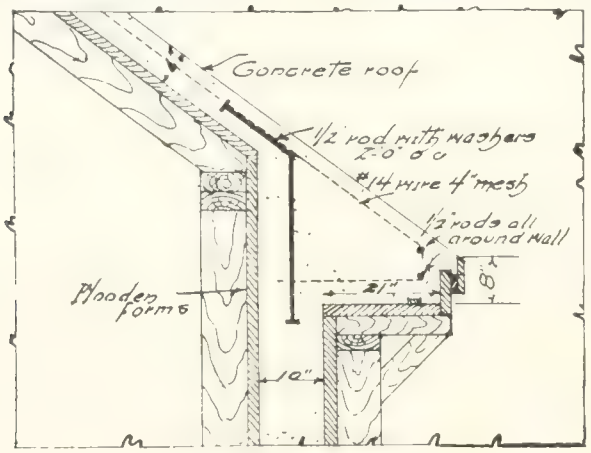


Figure 4

gravel, or 300 pounds of slag to each 100 square feet. The gravel or slag shall be from ¼ inch to ⅝ inch in size, dry and free from dirt. Flashings shall be constructed as called for in detail drawings.

There are, of course, other general specifications for applying roofings over concrete surfaces, and the following specification is for Carey's roof. This roof can be used on very steep surfaces.

The roofing will be furnished in rolls containing sufficient roofing to cover 100 square feet, surface measure, when applied, and to consist of the Carey standard weight and quality.

All concrete surfaces shall be prepared by the contractors having the work in charge, with a comparatively smooth, hard finish, free from holes and loose particles of sand and cement.

The roofing sheets are to be cemented to the concrete or tile surface with cement pitch heated to the proper degree and spread with a mop. The roofing sheets are to be embedded in the hot pitch as fast as it is applied, sufficient of the pitch is to be used to insure a secret hold of the roofing sheets to the concrete or tile surface underneath. Lay the finished burlap side of the roofing to the weather.

Begin by lining all valleys, gutters, etc., with the roofing in a workmanlike and water-tight manner. Full one-half sheets of roofing to be used in all valleys and gutters, running the sheet lengthwise so that the laps or joints will occur on the outside of the valley or gutter.

After the gutters, valleys, etc., have been properly lined, proceed with the application of the roofing

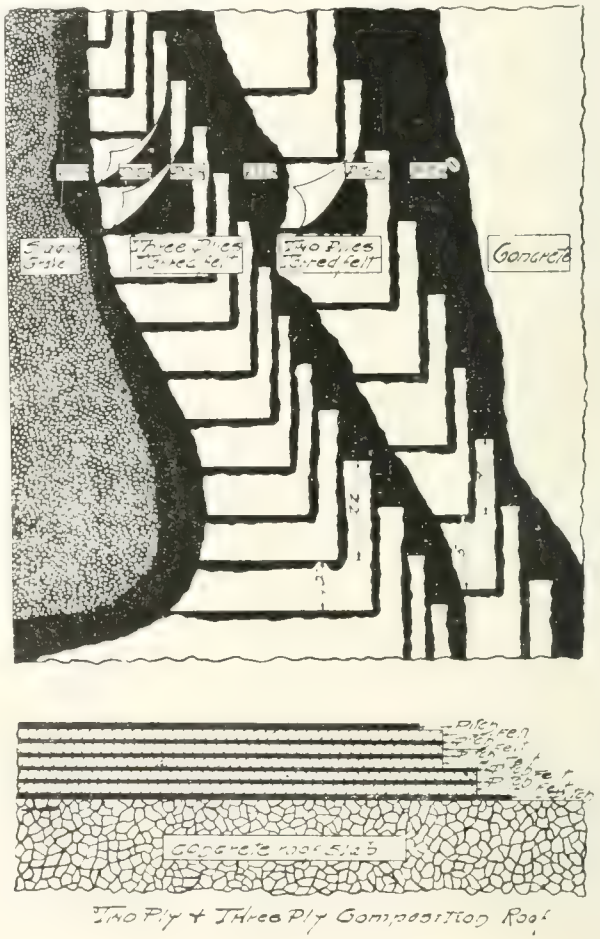


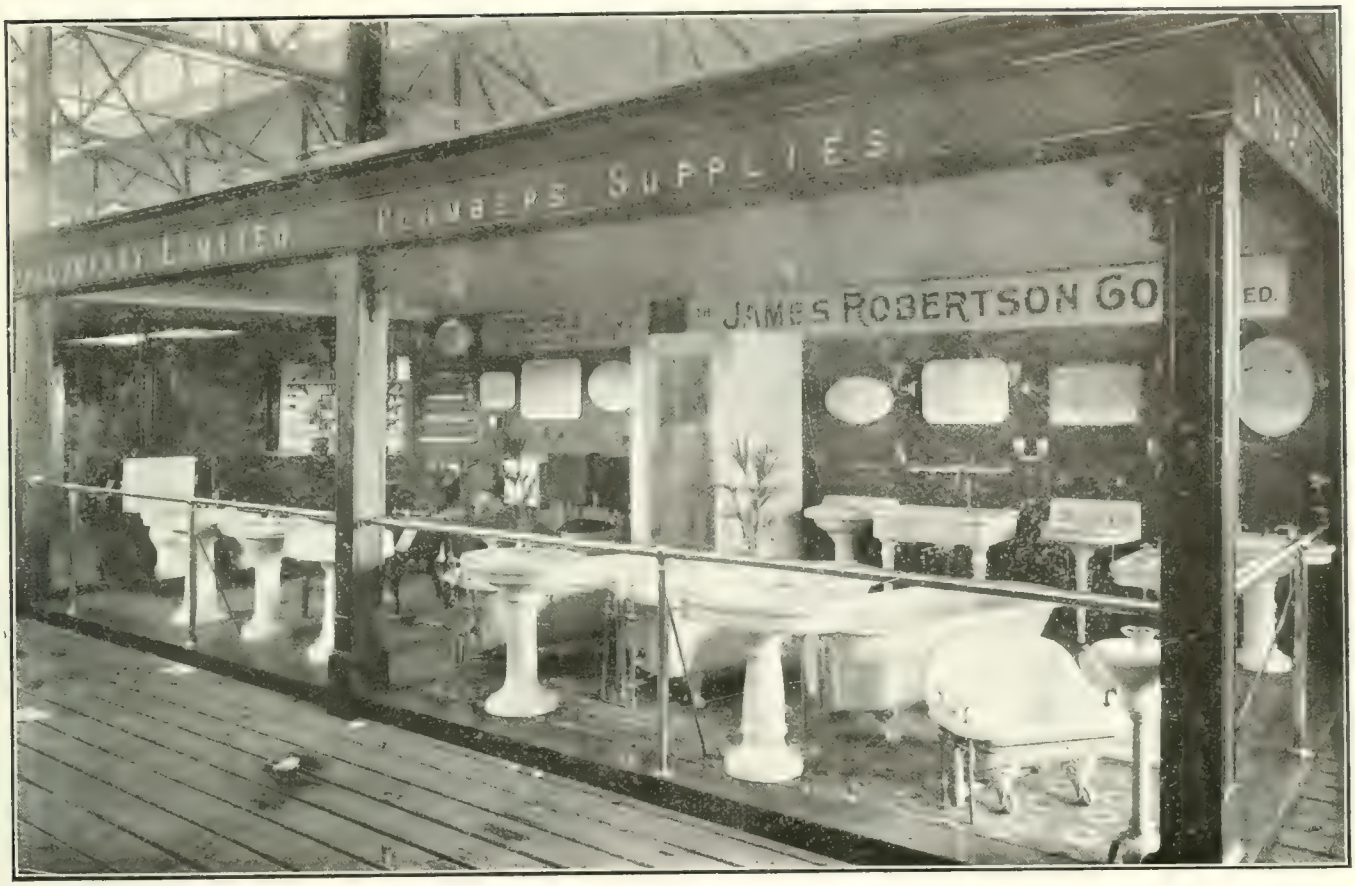
Figure 5

sheets to the main roof surface, running the sheets with the pitch to the roof, allowing, where the sheets join, a lap of not less than 2 inches. All laps, cross-seams, etc., to be cemented over with Carey's cement pitch. Where cross-joints occur, cover them over with a canvas strip 3 or 4 inches wide. This strip to be cemented down over the seam or joint with pitch.

The use of nails is not necessary, except where the roofing is applied on steep surfaces, in which case provision should be made for nailing the upper end of each sheet of roofing along the ridge of the roof.

Upon completion of the application of the roofing all loose scraps, dirt, etc., accumulated on the roof should be removed immediately and the roof surface swept clean.

The entire roof surface is to be given one coat of Magnesia paint as soon as the application of the roof is completed.



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CLAY PRODUCTS IN THE BATH ROOM.

The ideal bath room is one which may be made up almost exclusively of clay products, with the bare exception of the piping and metal work, says The Clay Worker. It has been thoroughly demonstrated that, from a sanitary standpoint, nothing equals the enameled clay ware, and gradually a discriminating public is taking notice of this fact and is showing a favorable disposition to use it almost exclusively. Now, aside from the technical matters involved, one important point the trade should take into consideration is this: We are coming to the day when practically everything in the form of a home built in or near cities is to have a bath room, and the more pretentious home, instead of having just one commodious one, is moving toward the idea of one to almost every sleeping room. Moreover, it will extend further and builders of modest homes in the country will include a bath room as a part of their house. Some of the cities have already taken quite a strong stand in this matter, and are insisting that when new homes are built that they are properly equipped with bath rooms.

APPLICATION OF TILE TO CONCRETE SURFACES.

By John Wynkoop, Architect, New York.

The beauty and treatment of concrete surfaces have not received the important study warranted by the nature of the material. A few authorities advocate leaving concrete surfaces just as they are when the rough forms are removed.

However meritorious this may be, the majority of architects look upon concrete as a material which from its very nature gives a most extended opportunity in surface decoration and color. Architecture in stone is essentially dependent upon architectural lines—shade and shadow—whereas architecture in brick or concrete is dependent upon the actual treatment of their surfaces for their character and effect.

From this viewpoint, which is that of the majority of architects, any material enriching the surface of a concrete wall without interfering with its structural strength is possible and worthy of consideration. Of stone, brick, pigments and tile, the latter is, undoubtedly, best adaptable because of its beauty and extreme simplicity in application. In France, Italy and America the application of tile to concrete surfaces has been considerably exploited, so that many actual examples exist upon which to base an opinion as to the effect produced. From these and from the general principles of design involved, it may be seen that extreme accuracy of tile setting, as we know the material in general use is harmful to fine effects and not to be desired. Concrete, especially for exterior use, should be sufficiently rough and uneven to insure artistic surface modeling when seen from a considerable distance. This necessitates a free and varied treatment of any tile applied to it, both as to setting and as to coloring. The color of the concrete itself, in the main determines the color scheme of such tiles as are applied to it. Rough and deeply colored tiles are found to blend most easily with the rough surface of the concrete, although it can easily be imagined how certain bands or spots in tile could be both highly colored and finished to bring out accents sought after by the designer.

Especially in country house work the application of tile must be concentrated largely because of the costliness of entirely covering the concrete. As a matter of effect, from an artist's point of view, what a concrete surface needs is contrast with some material which is more refined and decorative than itself. Panels, band courses or scattered designs in tiles, so long as they do not become all-over patterns, seem particularly advisable in this kind of work, as much depends upon concentrating this decoration as does upon an intelligent selection of colors and an artistic placing of the individual tiles. Without doubt there can be no limit to the ways in which tile employed in this way may be treated. Practically any size and shape, any color, any surface, are being manufactured continually, and along with this, moldings and special colors and combinations may be obtained, provided the manufacturer considers the amount to be ordered as warranting him to produce special ideas in this way.

ZINC AS A SUBSTITUTE FOR MORTAR IN MASONRY JOINTS.

It is stated that zinc instead of mortar was used for joining the stones of two elliptical arches of an eighty-two foot span that supports a newly completed armored concrete bridge near Lyons, France.

Previous experiment having proved that the molten zinc—at 800 degrees Fahrenheit—caused no fractures in dry stones, the zinc was melted and poured between the stones, forming metallic joints an eighth of an inch thick. The substitution for mortar increased the cost about $2.40 for each square foot of the bridge's horizontal surface.

Tests with cubical stones, 2½ in. on a side, showed that zinc joints do not weaken stones having a strength of about 14,000 lbs. per square inch, but are 10 or 15 per cent. weaker than stones having a strength between 14,000 and 18,500 lbs. A less compressible metal is needed for very hard stones.

Cement joints, when as thin as one-twenty-fifth of an inch or less, stood the tests equally well, but disintegration gradually reduces the original strength of joints of mortar.

BONDING NEW CONCRETE TO OLD.

In discussing the question of bonding new concrete to old, Albert Mayer, of the Vulcanite Portland Cement Company, presents the following suggestions:

Clean off with clear water and stiff broom the surface of the old concrete. Mix one part commercial muriatic acid or hydrochloric acid and four parts water, or use bonsit or ransomite mixed according to direc-

tions with hot water, make several applications one after another with a brush containing little or no metal. This will not injure the concrete, as the acid does not sink to a sufficient depth before it is neutralized.

This will have the effect of removing the cement from the top surface of each grain of sand or piece of stone and the other aggregates that may have been used, exposing the clean surface of these aggregates in exactly the same condition as they were before being mixed.

After applying the acid, wash the surface with clear water, scrubbing with a stiff broom or brush, removing all the dead particles. While the surface is still wet (and it should be thoroughly wet) apply the new concrete. Protect this new concrete by keeping it damp for at least a week. Do not let it dry out at any time during the first week.

It will be found that the new concrete will bond to the old as strongly as if both had been mixed at the same time.

CONCRETE BUILDINGS ARE LIGHT.

In discussing the use of concrete for the graphic arts, A. D. Mellor, of the Turner Construction Company, calls attention to the fact that there are no dark corners in concrete buildings. This type of construction makes it possible for a larger percentage of wall to be taken up with windows than is the case with any other type of construction. This means that the cost for artificial lighting is lower. It is the experience of occupants of this class of building that the efficiency of the workman is raised because of the better lighting and the better ventilation due to this large amount of window area. Manufacturers of clothing, who have occupied buildings of the mill type in lower Manhattan, and have moved to concrete buildings, testify that the efficiency of their workmen has been raised because of improved lighting. In summer, when the heat tends to lower the efficiency of the workmen, the beneficial effects of the good circulation of air which may be obtained by opening all the large windows is marked.

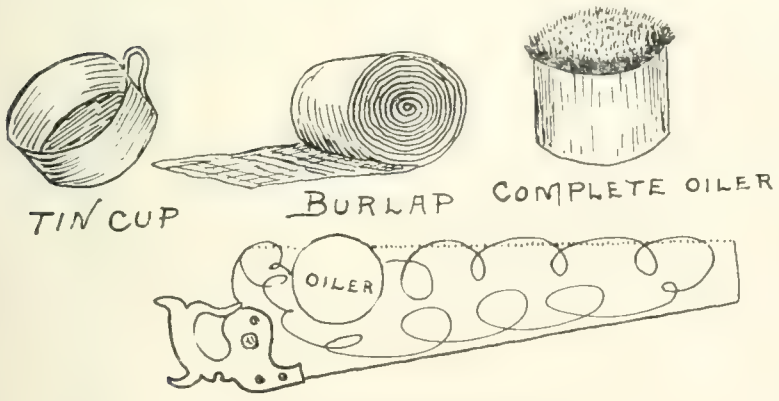
CARPENTRY AND WOOD-WORKING

Doors, Sashes, Flooring, Staircases, Fireplaces, Porch Columns, Floor Scrapers, Builders' Hardware, Carpenters' and Shop Tools and Equipment

OILER FOR HAND SAW.

By W. A. Lane.

Keeping saws bright and free from spots is not an easy thing to do, while oiling them with a cloth is rather a mussy affair, so if this oiler is tried once I think all will like it. Take a small tin cup, or part of a tin can, about 2½ inches deep is a good size. Cut a strip of burlap, or some similar material, 3 inches wide or ½ inch wider than the depth of the receptacle used. Roll this tight, having the roll large enough to be a very snug fit into the cup. The part which projects



HOW TO KEEP THE SAW BRIGHT.

should be raveled out to form a sort of a stubby brush. Soak this cloth thoroughly with oil and it is ready for use. Keep it well saturated all the time and when oiling the saw use a circular movement as shown in the drawing. Should there be any spots or rust on the saw, sprinkle a little emery dust on the oiler. Before sawing lumber containing much pitch, rub the teeth of the saw with the oiler and they will not become gummed.

THE HAND SAW.

The hand saw is the constant companion of the carpenter. There are a few other tools he carries incessantly, the hatchet and the square, but aside from these and even with these, the hand saw is probably the most useful tool in his kit, and most often abused.

Some carpenters are one-saw carpenters. That is, they are men who have one favorite hand saw that they use for everything, for heavy framing, for cutting weather boarding, for cutting inside finish. Again, there are others who have a different saw for every kind of work.

It is these men, these latter, who generally get the best results and take the best care of their saws. In the hand saw, as in a mill saw, it should be adapted to a peculiar class of work. A good framing saw will cut weather boarding, but it will not do as nice a job as a finer toothed saw. Neither will the fine toothed saw used for cabinet work and finish make as good headway cutting heavy framing.

Some men vary their saws according to the work they have to do by different degrees of coarseness in their teeth, and also in their length.

There are some men, tall and lanky, with long arms, who want a framing saw at least two inches longer than the average saw, so as to get the benefit of the full stroke, and often these very men when they get to cutting mitre joints or weather boarding, want to use a saw from two to four inches shorter than the average, with very fine teeth.

We may take it that the main division or variation for the class of work should be by the teeth and the thickness of the blades. For framing use saws with coarse teeth and comparatively heavy blade; for weather boarding, fine teeth with a thinner blade, and for some interior finish one may use even a finer tooth blade than for the weather boarding, with a blade reinforced with a stiff back.

The disposition now seems to be to use saws with a few more teeth to the inch than formerly. There was a time when the favorite framing saw had from five to seven teeth to the inch, whereas to-day it runs from seven to nine. Formerly the weather boarding saw had from seven to nine teeth to the inch, whereas to-day they run from nine to twelve.

It is not always this way, because people have different ideas. As stated above, some people use practically the same saw for everything about a house, and others have a wide variety. A different saw for every kind of work and generally they keep it filed and in shape especially for that work.

This is the way to get the best results. Make your work into a series of divisions, at least three of them, and have saws for each division of work. Then keep them fitted up especially for doing that work. It will take a little more time and a little more attention and call for a few more tools in the end, but there will be enough gain in both quantity and quality of work to pay for it.

In short, the hand saw, which is the best side companion of the carpenter, generally gets too much abuse and not enough appreciation and care. It is filed in a hurry, often carelessly and poorly, is used roughly by some, is kinked, and is left out and allowed to rust and gets more rough treatment considering its qualities than any other tool.

The best way to create a live interest and insure better attention for your saws is to start in by buying the best kind of saws you can find, selecting them carefully for the use you have. Then having a saw that you are proud of in the beginning, you will likely take better care of it as you go along.

THE ORIGIN OF THE BUNGALOW.

The word bungalow is an Anglo-Indian version of the Hindi bangla, which primarily means Bengali, or of Bengal, and is also applied to a thatched hut, says Country Life in America. It may be worth while to explain how this trivial and merely local name came to be fixed on the Englishman's house in India.

Early residents there, engaged in military, administrative or trading duties, lived in a nomadic life for the greater part of the year in tents. And since there was nothing in the indigenous buildings of Bengal suited to their requirements, their first dwelling houses, designed by themselves and built of materials at site, were naturally planned on the model of the Indian service tents to which they were accustomed—that is, a large and lofty room surrounded by double walls of canvas, enclosing space between them, with partitions at two or more corners for bath or store rooms.

LAYING AND SCRAPING OF OAK FLOORS.

Oak flooring requires some care in laying, as it is very easy to ruin, by incompetent workmanship, what would otherwise be a perfect floor. Judgment must be used in selecting the different pieces so that they shall blend well and the floor shall present an even shade, and not be dark and light in streaks. This can be done if a little care is used.

If the floor is to be laid over an old floor, remove the quarter-round and sweep the floor clean. Lay the new strips at right angles to those of the old floor. In new houses, the sub-floor is usually laid diagonally. The top flooring is laid across the joists, starting from the longest straight wall, and striking a chalk line from end to end just far enough from the base-board to admit one piece of flooring. Nail the first piece of flooring straight on this line, setting the nails well through the piece. Then start by selecting the light-colored strips and laying aside the darker ones until all of the light pieces have been laid. Then select the lightest of the dark, and so on, until the floor is finished. By doing this a floor of even color can be obtained. This is the most important part of laying oak floors. When the hearth is reached, miter a hearth-strip or a piece of flooring around same, continuing until the wall is reached, and then nailing the last piece through the face in the same manner as the first piece was nailed.

If more than one room is to be laid, it is much better to select separate shades for the different rooms, laying the light stock in the darkest room. It is best, when laying over old floors or sub-floors, to use a good

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¶ As the August and September issues of this paper were not published, all subscriptions will be dated forward two months.

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September 29th, 1911

quality of damp-proof paper or deadening felt under the top flooring.

The flooring should be securely nailed. On 3/8 and 1/2 inch, the nails should not be over six inches apart: on 5/8 and 13-16 inch, not over eight to twelve inches apart when laid on sub-floors, and twelve to sixteen inches when laid on joist. On sub-floors the nails should be "staggered." Be careful in nailing not to mar the surface of the floor in driving up the nails.

While there are a great many machines made for scraping floors which give good satisfaction, on high-class work it is much better to do this by hand, using a cabinet scraper. This part of the work should be done with the greatest care, as proper scraping is essential for a perfect finish. Always scrape lengthwise of the wood not across the grain. No amount of sand papering will remedy the defects in scraping, such as wavy surfaces or the strokes left by the knife. These defects show much more when the floor is finished than when it is being scraped. A floor properly scraped looks very smooth, but still it should be thoroughly gone over with "No. 1½" sandpaper to obtain the best result in finishing. This should be done carefully by getting on the knees, throwing the weight of the body on the sandpaper, and running it in long, even strokes with the grain of the wood. When the work is done, the floor swept clean, and the dust removed with a soft cloth, the floor is ready for the finish.

PAINTING and DECORATING PLASTERING

Paints, Stains, and Varnishes, Shingle Stains, Waterproofing, Wall Finishes, White Lead, Window Glass, Putty, Oils, Metal Laths and Plaster

THE INFLUENCE OF SHINGLE STAINS UPON THE DEVELOPMENT OF THE SHINGLED HOUSE.

It is not too much to say that the invention of shingle stains has made the wide vogue of the shingled house possible, says The National Builder. It was known from the first that paint was not fit to put on shingles, because it would cause them to rot more quickly than as if they were not treated, and the coloring effect was not artistic. Paint forms a coating over the surface of the shingle and prevents the escape of the moisture, which it is impossible to entirely keep out of the shingle. This hastens decay, and painted shingles are often found which look sound, but are really nothing but a crust of paint.

The invention of shingle stains by Mr. Samuel Cabot, chemist, of Boston, in the early 80's, solved the coloring problem, and Mr. Cabot's ingenuity also added to his discovery of the great merit of preserving the shingles. At that time the preservative value of creosote was very little known except to scientific men, but Mr. Cabot knew it, and used it as a basis for his Creosote Shingle Stains. This gave him a combination that produced soft, transparent and velvety coloring effects that were fully as durable as the best paint; also thorough preservation of the wood by means of the creosote, and at a cost that was only about half that of paint, both for buying and applying. In other words, he cut down the cost one-half and produced an infinitely more artistic result, and instead of hastening the decay of the shingles, as paint did, it prevented their decay.

The colors and shades in which Cabot's stains are made are infinite, and the artistic qualities of the stained shingle house have so appealed to the architects and owners that shingled houses have become universally popular. In fact, the experience with the shingled house has taught people that they can use shingle stains upon rough siding with splendid effects, and bungalows all over the country show evidence of this development. One of the oldest architects said that in the discovery of shingle stains, Mr. Cabot had made the first improvement in exterior coloring in half a century.

CLEANING WINDOW BLINDS.

If window blinds are finished in the natural with varnish, remove them from their hinges and take them to the yard, dust well and use a mixture of two parts strong household vinegar and one part sweet oil or raw linseed oil, which stir or shake well while in use, says The Painters' Magazine. Apply with a brush vigorously over all and dry with a cloth. Rinse well with water and permit to dry. To remove the dust it is well to have a pair of bellows to get into the corners.

If the blinds are painted, make a cleansing solution of one pound brown soap, one ounce of pulverized borax, dissolved in one gallon hot water, but do not let it boil. Use a piece of flannel for the framework, but a good brush for the slat work, and rinse off quickly when the paint is clean.

If you wish, however, to remove the paint or varnish from blinds for the purpose of refinishing same, put them in a shallow trough, one at a time, which has been filled with a solution of 8 lbs. of concentrated potash lye in 32 gals. of water. The paint or varnish will soon soften, and can be removed with a stiff brush. Now the blind must be washed in clear water with a whisk broom, so that the water gets into every corner. When the blinds are dry they should be given a wash with vinegar to neutralize the alkali, and when dry it will be found that the fiber has been raised some and sandpapering is necessary.

Paint and varnish removers, as they are now on the market in liquid form, are more effective and less troublesome, but of course very expensive for cleaning paint or varnish from blinds.

SUGGESTIONS REGARDING PLASTERING.

By William Arthur, in The Building Age.

Plaster.

Till near the end of the last century lime plaster was the only kind used. If well put on it was good enough for any house, but it was comparatively seldom that it was well put on. The ordinary method was to put on the first two heavy coats at one time, and the finish coat when these were dried, instead of putting on the three coats separately. When each coat was thoroughly dried before the next was put on, the result

was a good wall, if good material was used. Under stress of competition the sand pile was resorted to, and lime plaster of itself was often unjustly blamed.

In some parts of the country this plaster is still used, but it is safe to say that nine-tenths of the work done—apart from patented products—is with the cement, or "hard-wall" plasters. With these there is the difference between lime and cement. In general, a far better wall is assured than by using the old material.

Number of Coats.

There may be two-coat or three-coat work, as with lime. On metal lath three-coat work is preferable, because the white or sand-finished wall is not obtainable with two coats. The first has to be spread thin on the metal for a body; after it is dry, the brown, or heavy coat, is applied, and then the finish.

For ordinary houses two-coat work is used. This means, on lath, a first fibred coat; then, without leaving the room, a brown coat, and a finish coat when these two are dry. On brick or other masonry walls the custom is to leave off the first, or scratch coat, and use only the brown. This system of putting on the three coats in two operations is known as drawn work.

The series runs on wood lath: First, or scratch, coat; brown coat, and skim coat, that is, white or sand finish. On masonry: Brown coat, and finish.

The inherent politeness of humanity is illustrated by the term "scratch coat," which should be scratched or roughened, but is often left plain. If a mere name will soothe the feelings, why not use it?

The common finish is white, but a sand finish is better when the walls are to be painted, tinted or decorated in some way. The bungalow people, with their rustic ideas and hatred for mere wall paper, usually prefer the sand finish, unless, of course, the ceilings are left open, just as in the plowmen's cottages of the old, palmy days. Sand finish should never be used if walls are to be papered.

Brushes: Their Use and Abuse

Extracts from an Article by Walter D. Foss

Elbert Hubbard says, "A brush is a broom with a college education."

Webster gives nine definitions of the word "brush." The one in which you are interested, I assume, is the following:

"An instrument composed of bristles, or other like material, set in a suitable back or handle, as of wood, bone or ivory, and used for various purposes, as in removing dust from clothes or laying on colors. Brushes have different shapes and names according to their use, as clothes brush, tooth brush, paint or varnish brush, etc."

The art of brush-making, and it may justly be termed an art, has also made great strides in recent years as to the methods employed for holding the bristles within the ferrules. Formerly we depended largely upon glue, pitch or cement of some kind; to-day these agencies are not absolutely necessary, and even the tacks or nails are dispensed with in the manufacture of high grade, metal bound brushes. After the bristles have been placed within the ferrule, the handle, plug or wedge, and ferrule are forced together by machinery under high pressure, and the ferrule swedged, or compressed, so that it is impossible for the brush to shed bristles or come apart, no matter for what purpose or in what kind of material the bristles are used. This process we consider far superior to a setting in rubber, or other like material, which necessitates a vulcanization process, which bakes the life out of the bristles to such an extent that they break off or wear out quickly, for after all is said and done, the really important part of a brush is the bristle end of it.

Too much cannot be said in regard to the use and care of brushes. More brushes are lost through lack of proper care than are worn out. We have seen many persons who were supposed to be good painters, but who did not seem to understand anything about taking care of their tools. Cold, dry winters are especially severe on brushes, which are usually kept in buildings that are heated by steam, furnace or other dry heat.

A brush should never be condemned because it contains a few loose hairs, for while the manufacturer exercises care in removing as many of these as possible before shipping, it sometimes happens that a few, too short to have been caught in the ferrule, will remain; a careful workman will remove all these before he puts his brush to use by dipping it into paint or varnish and drawing it several times across a rough, unplaned board. An hour's use, however, and this defect will cure itself.

It is important to properly swell the head of a new oval or round paint or varnish brush before putting it to use, but under no circumstances should ANY BRUSH be put into water to soak, bristle downward, with the weight of the brush resting on the ends of the bristles, for water-soaked bristles will always work flabby, and if the bristles are of a fine grade, you may expect your brush to twist out of shape.

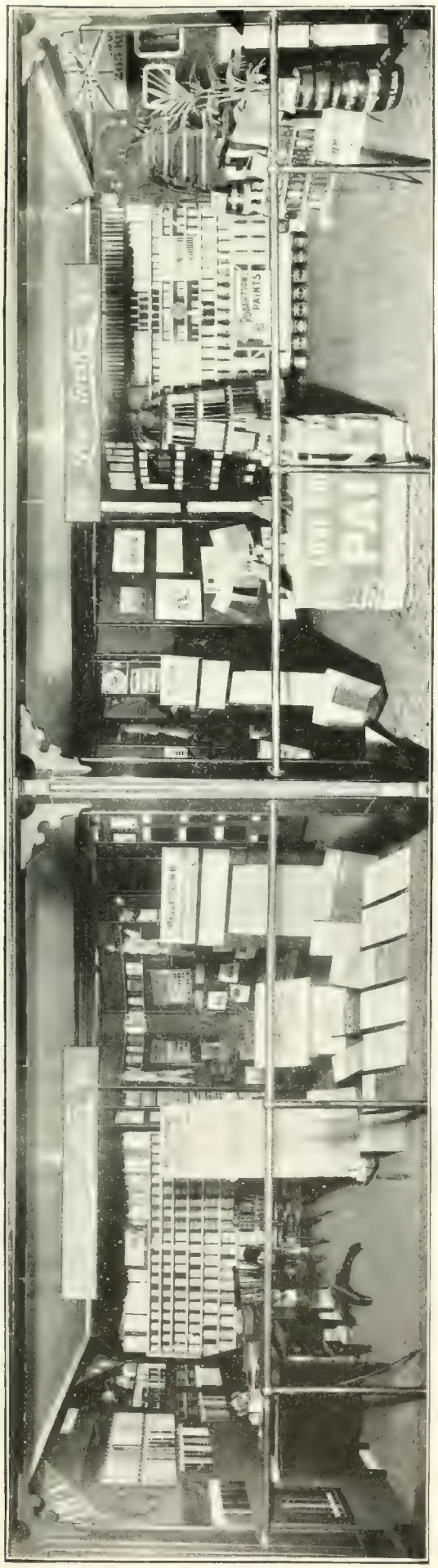
The best method of swelling the head of a brush that has dried out is to separate the bristles carefully and pour about a tablespoonful of water on to the end of the handle, and then allow the brush to stand, bristle up, until the water has been absorbed. This will swell the head of the brush, without soaking the elasticity out of the bristles and making them flabby. If you will take a hog bristle and cut it across, then examine one of the cut ends with a microscope, you will find it to be a hollow tube, and in the soft, or flag end it will branch off into a number of small tubes; therefore, when you put a new brush into water to soak, the little tubes open and the water will rise into the center of the bristles just as far as your brush extends into the water, then when you put your water-soaked brush into color you seal the small openings and the water will remain until the brush is nearly worn out. Soaking bristles in water explains why many brushes are condemned as being like dish rags.

Keep your brushes in a cool or even moderately damp place, as near the floor as possible.

A brush stamped "Cement set" is intended for use in paint, paste, varnish or water color, and should never be used in shellac or alcohol.

A brush stamped "Glue set" is intended for use in shellac or varnish only, and should not be put into water, even after it has been well broken in.

Never put a whitewash or kalsomine brush into newly slaked lime or acids. If the solution is too hot to permit you to put your hand into it, it will surely burn the bristle and destroy the usefulness of the brush. Manufacturers of water paints and kalsomine mixtures are



An Attractive Paint Display by Lowe Brothers.

using "casein" as a binder instead of glue; there is usually a sufficient quantity of acid in casein to destroy the life and usefulness of bristles, but by frequently washing and suspending your brush in clean water over night, much of the harm occasioned by the use of these injurious compounds may be avoided.

Shellac brushes, if in use every day, should be suspended in shellac over night. If used only occasionally, they should be thoroughly cleaned in alcohol before putting away.

Varnish brushes, when not in use, will keep best if suspended in oil thinned with turpentine.

Lettering and striping pencils should have the color thoroughly cleaned out of them and pointed in oil before putting away.

Good brushes are frequently abused and sometimes ruined by being carelessly thrown into a tub of water, no care being exercised as to whether the bristles are straight or not, or whether the weight of the brush rests upon the end of the bristles. Let me suggest that you hang or suspend your brushes in your tubs so that the points of the bristles will not touch the bottom of the vessel; a little care will save you a great deal of time, money and annoyance, and you will quickly observe the improvement in the working qualities of your tools.

Brushes which have become hard, because the water in which they were set away for a season had evaporated, can usually be restored by first soaking them for a couple of hours in one of the patent paint removers, until the hard point becomes softened, then cleaning it off with a putty knife and washing the brush thoroughly with soap and warm water.

CEMENTS FOR FIXING GLASS TO METAL.

To cement glass to metal a mixture of sodium silicate and quartz meal, taking 12 to 24 hours to set hard, is recommended in an article in the National Glass Budget, of Pittsburg. If the color of the cementing agent is unimportant, a useful preparation may be obtained by soaking leather scrap glue in water, melting it by heat, and then mixing it with 11 lbs. of pitch, 4½ lbs. of asphaltum, and 4½ lbs. of resin to each 1¾ lbs. of blue solution. The mass may be loaded with powdered slate, etc., without losing its adhesive properties. An equally good cement is prepared by dissolving equal parts of Russian glue and shellac, and adding levigated chalk. Casein cement, for immediate use, is made by mixing fresh curd with one-fourth its weight of powdered chalk; while a second preparation that will keep consists of a solution of casein in ammonia, or of a solution of the same material in a 5 per cent. solution of caustic soda or borax, with the addition of a very small proportion of hexamethylenetetramine. This cement is impervious to water.

Resin adhesives are also used, the "amber" cement employed by jewelers being composed of three parts of mastic and two to four parts of shellac, dissolved to a syrupy consistency in 90 per cent. alcohol.

Much of the artistic appearance of monolithic walls in concrete construction depend upon the skill and understanding with which the work is put in. "Keep the joints out of sight" and "keep them level" are injunctions worth remembering.

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THE CANADIAN BUILDER.

With this issue The Canadian Builder succeeds The Builder and Contractor, and with a new organization behind it.

Mr. Kenneth A. McKenzie, "the man behind" The Builder and Contractor, had spent many months preparing his plans and perfecting his organization to make the paper one of the most useful in Canada. The proof of his success has been furnished in the fact that in less than seven months subscriptions were secured from over a thousand builders, contractors, carpenters, master painters, master plumbers and others connected with the building trades.

Any person familiar with the establishment of such journals in Canada will recognize this to be an unusual record in circulation building.

An exceptionally attractive opportunity in British Columbia was presented to Mr. McKenzie, however, and the present owners bought the paper outright from its former owners, assuming all liabilities to the subscribers who have paid for their subscriptions in advance and are entitled to receive the paper for the next year or so.

Owing to the need of building up an organization to take care of this paper, we have not published an issue in August or September. Instead we are bringing out the October issue early in the month.

This means that all subscriptions received will be dated two months ahead. For instance, the man who subscribed for two years from last June will be credited as paid to August, 1913, instead of June, 1913.

It will be our policy to make the paper of the greatest possible value to the practical builder, from the man "who builds to sell" to the foremen in charge of construction work.

We have not yet brought the organization behind the paper to the point desired. We especially want contributions and will pay liberally for all articles dealing with practical building topics.

In a few weeks we will have this organization complete. The Commercial Press, Limited, has built up to the point of outstanding success three technical papers and two trade papers, and has no hesitancy in promising to make The Canadian Builder equally useful to readers and advertisers.

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In order to make this paper of the greatest possible service to the builder, we have determined to cover as fully as possible all the branches of building activity.

To this end we have decided to establish three special departments to construction problems, one to "Brick Work, Concrete Work and Masonry," one to "Carpentry and Wood Working," and one to "Roofing and Metal Working," and two special departments to finishing problems, one to "Heating, Lighting and Plumbing," and one to "Painting and Decorating Plastering."

With a number of good, strong general articles each month, and with each of above departments kept up to standard, we are confident the paper will be one of the most helpful published.

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A Pleasant Design of House Suitable for Town or Country

Approximate Cost, $2,200

The accompanying half-tone or drawings are of a compact, attractive and well designed cottage. It is a most complete little house in every particular. It is finished in ash, first floor; softwood, second floor, painted white. The first floor has hardwood floors while softwood is used on second floor. This house has just been completed in Quebec at the contract price of $2,200, including plumbing. It is heated by a furnace.

Homes such as this one are within the reach of almost anyone. The cost in almost any locality should not exceed $2,500. If, instead of using shingles all the way up, it were cement coated up to the second floor, a most desirable effect could be produced.

The White cottage has cellar 7 ft. 6 in. under the whole house; first floor, 9 ft. clear; second floor, 8 ft. clear; single-boarded on outside with T. & G. spruce boards, well air-dried, two thicknesses pulp paper, then shingled with XX cedar shingles, laid 5½ in. to weather on walls, and XXX cedar shingles on roof, 4 in. to weather on lower part and 4½ in. above break in roof. The entire interior walls are covered with two-ply pulp paper, put on vertically, tacked to studding, then secured with 1 in. x 2 in. furrings, nailed to studding, then lathed and plastered with two coats of asbestic paper, last coat being putty finish, and trowelled smooth.

The entire interior, except kitchen and pantry, is finished with selected brown ash, with solid ash five across panelled, flush moulded doors, 1⅜ in. thick. Kitchen and pantry are finished with basswood, painted three coats. Pantry is fitted with cupboards having panelled doors, enclosing all shelving. Drawers, places for flour barrels, having swings, etc., complete in every detail.

First floor has T. & G. kiln-dried, clear birch flooring, 2½-in. face measure scraped to smooth finish.

The second floor is covered with T. & G. kiln-dried spruce, 3½-in. face surface, smoothed where necessary at joints, etc. All ash finish on first floor is stained light oak, then filled, given two coats shellac and one coat varnish. Hardwood floors are waxed and polished. All finish on second floor, including floors, is painted three coats, each room having a different color. Hall is painted white.

The fireplace in the living room has wood mantel

shelf. The recess next to the fireplace is filled with adjustable shelves for books, etc., both the bookcase and fireplace, being recessed, do not take any space from the living room, thus making a very fine room. The front window of living room is glazed with plate glass and crystal-leaded transom as well as the oval window in stair landing. The effect from the living-room of the window-seat and box-seat at the left is very fine. The cellar has a cemented floor and sufficient windows to make very light

The house is heated with No. 22 Heela hot-air furnace, with pipes leading to every room, which has a steel wall register, the one in the bathroom being placed about three feet from floor. This is a feature that is convenient in more than one way. Cold-air pipes are taken from the vestibule, dining-room and near kitchen door on outside walls. Will say that this has been the most successful way of installing hot-air furnaces that I have had, giving perfect satisfaction to clients in every case. It is practically impossible in this climate of ours to build in such a way that no cold air can get into the rooms; it is usually the case that enough gets in, so that if heating system is properly installed and the water-pan kept filled (a tap being over the pan from the water main, which should always be done) the health of the occupants will be all that could be desired, as far as artificial heating has to do with it, as well as keeping the cost of fuel down, which cannot be done by taking the air from outside. Open plumbing work, bathroom having 5½-foot bath, low-down tank w.c. and enamelled lavatory; 30-gallon hot-water tank connected with range, 20 x 30. Enamelled sink in pantry; 4-in. C.G. vent-pipe running through roof.

The house is wired for electric lights, and each outlet having wall-switch in most convenient place, all done according to rules and regulations of underwriters. In fact, the whole house is all that could be desired or expected by anyone wanting a real home that did not exceed the sum of $2,500.

List of Dimensions of Lumber Required for Residence.

1	Girder	30′ 0″ x 6″ x 8″		120
1	Girder	10′ 0″ x 6″ x 8″		40
12	Sills	12′ 0″ x 2″ x 8″		192
9	First-floor joists	17′ 0″ x 2″ x 8″		204
9	First-floor joists	15′ 0″ x 2″ x 8″		180
10	First-floor joists	14′ 0″ x 2″ x 8″		188
10	First-floor joists	12′ 0″ x 2″ x 8″		160
11	Second-floor joists	17′ 0″ x 2″ x 8″		250.8
11	Second-floor joists	15′ 0″ x 2″ x 8″		220
12	Second-floor joists	14′ 0″ x 2″ x 8″		225.6
12	Second-floor joists	12′ 0″ x 2″ x 8″		192
8	Ceiling joists	17′ 0″ x 2″ x 6″		156
8	Ceiling joists	15′ 0″ x 2″ x 6″		120
9	Ceiling joists	14′ 0″ x 2″ x 6″		126
9	Ceiling joists	12′ 0″ x 2″ x 6″		108
50	Rafters	14′ 0″ x 2″ x 6″		720
4	Hip Rafters	22′ 0″ x 2″ x 8″		117.6
125	Wall joists	20′ 0″ x 2″ x 4″	P.I.S.	1,675
24	Wall plates	12′ 0″ x 2″ x 4″	P.I.S.I.E.	112
60	Partition joists	9′ 0″ x 2″ x 4″		360
45	Partition joists	8′ 0″ x 2″ x 4″		243
33	Partition plates	12′ 0″ x 2″ x 4″	P.I.S.T.I.E.	264
60	Partition joists	8′ 0″ x 2″ x 3″		240
18	Partition plates	12′ 0″ x 2″ x 3″		108
2	Piazza hips—floor	14′ 0″ x 2″ x 8″		37.6
3	Piazza cross joists	10′ 9″ x 3″ x 8″		60
25	Piazza plates	12′ 0″ x 2″ x 8″		400
7	Piazza joists	12′ 0″ x 2″ x 7″		350
18	Piazza rafters	10′ 0″ x 2″ x 5″		151.2
7	Piazza studdings	8′ 0″ x 2″ x 3″		68
24	Ceiling joists	10′ 0″ x 2″ x 3″		120
10	Stair stringers	12′ 0″ x 2″ x 10″		400
	Total dimensions			7,908′

6½ M. feet to lay T. & G. hemlock
3,800′ square-edged hemlock P.I.S.

16 M. XXX cedar shingles.
115 Bunches laths
19 M. XX shingles.
165 Pieces furrings, 12′ 0″ x 2″ x ⅞″.
500 Lineal feet grounds, ⅞″ x ¾″.
1 Door to kitchen, ash, 2′ 8″ x 6′ 8″ x 1¾″ 4 panels M. 2 S.
1 Door to pantry, ash, 2′ 6″ x 6′ 8″ x 1¾″, ¾ panels M. 2 S.

Basswood.

2 Jambs, 6′ 10″ x 5½″ x 1¼″, rabetted for 1⅜″ door.
1 Head jamb, 2′ 9″ x 5½″ x 1¼″, rabetted for 1⅜″ door.
2 Jambs, 6′ 6″ x 3½″ x 1¼″, rabetted for 1⅜″ door.
1 Head jamb, 2′ 6″ x 3½″ x 1¼″, rabetted for 1⅜″ door.
2 Jambs, 6′ 10″ x 3½″ x 1¼″, rabetted for 1⅜″ door.
1 Head jamb, 2′ 4″ x 3½″ x 1¼″, rabetted for 1⅜″ door.
6 Window casings, 5′ 6″ x 4½″ x ⅞″.
2 Head window casings, 3′ 0″ x 4 ½″ x ⅞″.
1 Head window casing, 2′ 0″ x 4½″ x ⅞″.
2 Sill caps, 4′ 0″ x 4½″ x ⅞″.
1 Sill cap, 8′ 0″ x 4½″ x ⅞″.
2 Surbases, 4′ 0″ x 3¾″ x ⅞″.
1 Surbase, 3′ 0″ x 3¾″ x ⅞″.
12 Door casings, 6′ 0″ x 4½″ x ⅞″.
4 Door casings, 5′ 8″ x 4½″ x ⅞″.
2 Door casings, 6′ 6″ x 4½″ x ⅞″.
8 Head door casings, 2′ 8″ x 4½″ x ⅞″.
1 Head door casing, 2′ 10″ x 4½″ x ⅞″.
18 Plinth blocks, 10½″ x 4¾″ x 1″.
24 Corner, 4″ x 4¾″ x 1″.
7 Base boards, 12′ 0″ x 7¾″ x ⅞″.
7 Pieces moulding, 12′ 0″ x 1¾″ x ⅞″.
12 Treads, 2′ 6″ x 10¾″ x ⅞″, round one edge.
2¼ Turn treads, 2′ 6″ x 30″ x 0″, round one edge.
13 Risers, 2′ 6″ x 8″ x ⅞″.
1 Riser, 3′ 6″ x 8″ x ⅞″.
3 Skirt boards, 12′ 0″ x 10¾″ x ⅞″.
1 Door, cellar, 2′ 2″ x 6′ 4″ x 1⅜″.
1 Door, rear stairs, 2′ 2″ x 6′ 8″ x 1⅜″.
1 Door, pantry.
800′ to lay, T. & G. K.D., 2¼″ wide, No. 1 birch flooring.
Cupboards in pantry, $40.
4 Cellar frames and sash, 10″ x 18″, three lights.
2 Cellar frames and sash, 10″ x 18″, four lights.
1 Mullion frame and cash, 28″ x 30, two lights, 1⅜″ jambs, 6½″ weigh.
6 Surbases, rabetted, ash, 4′ 0″ x 3¾″ x ⅞″.
1 Surbase, rabetted, ash, 7′ 0″ x 3¾″ x ⅞″.
1 Surbase, rabetted, ash, 5′ 0″ x 3¾″ x ⅞″.
4 Jambs, archway, 7′ 6″ x 5½″ x ⅞″.
1 Head jamb, ash, 5′ 0″ x 5½″ x ⅞″.
1 Head jamb, ash, 7′ 0″ x 5½″ x ⅞″.
2 Head jambs, ash, 7′ 2″ x 5½″ x 1¼″.
1 Head jamb, ash, 3′ 1″ x 5½″ x 1¼″, rabetted for 1¾″ door.
4 Head jambs, ash, 6′ 19″ x 5½″ x 1¼″.
1 Head jamb, ash,, 2′ 8″ x 5½″ x 1¼″.
1 Head jamb, ash, 2′ 10″ x 5½″ x 1¼″.
2 Head jambs, ash, 6′ 0″ x 5½″ x 1¼″.
1 Head jamb, ash, 2′ 0″ x 5½″ x 1¼″.
8 Arch castings, ash, 6′ 8″ x 4½″ x ⅞″.
2 Half-inch head castings, ash, 5′ 2″ x 4½″ x ⅞″.
2 Half-inch head castings, ash, 7′ 2″ x 4½″ x ⅞″.
8 Door castings, 6′ 6″ x 4½″ x ⅞″.
2 Door head castings, 3′ 1½″ x 4½″ x ⅞″.
2 Door head castings, 1′ 8″ x 4½″ x ⅞″.
4 Door head castings, 6′ 0″ x 4½″ x ⅞″.
2 Door head castings, 2′ 9″ x 4½″ x ⅞″.

Second Floor.

1 Window frame and border light sash, 30″ x 24″.
8 Window frames and sashes, 28″ x 28″, 1⅜″, ten lights, weighted.
1 Window frame and sash, 40″ x 28″, 1⅜″, thirteen lights, weighted.
1 Window frame and sash, 18″ x 28″, 1⅜″, seven lights, weighted.
1 Exterior door and frame, 2′ 8″ x 6′ 8″ x 1¾″, half glass, pine.
4 Pieces pedestal caps, 2′ 0″ x 8″ x 1¾″.
2 Pieces Scotia, 12′ 0″ x ⅞″ x ⅞″.
2 Pieces top and bottom rail, 8′ 0″ x 3¾″ x 1¾″.
1 Piece top and bottom rail, 7′ 0″ x 3¾″ x 1¾″.
66 Balusters, 2′ 0″ x 1¾″ x 1¾″.
20 Window casings, 5′ 0″ x 4½″ x ⅞″.
12 Head window casings, 2′ 10″ x 4½″ x ⅞″.
1 Head window casing, 2′ 0″ x 4½″ x ⅞″.
1 Head window casing, 4′ 0″ x 4½″ x ⅞″.
9 Stool caps, 3′ 8″ x 4½″ x ⅞″.

1 Stool cap, 3′ 0″ x 4½″ x ⅞″.
1 Stool cap, 4′ 0″ x 4½″ x ⅞″.
3 Surbases, 3′ 8″ x 3¾″ x ⅞″.
1 Surbase, 3′ 0″ x 3¾″ x ⅞″.
1 Surbase, 5′ 0″ x 3¾″ x ⅞″.
38 Door casings, 6′ 0″ x 4½″ x ⅞″.
19 Headers, 2′ 8″ x 4½″ x ⅞″.
8 Jambs, 6′ 8″ x 5½″ x 1¼″, rabetted 1⅜″.
8 Jambs, 6′ 8″ x 4½″ x 1¼″, rabetted 1⅜″.
4 Head jambs, 2′ 8″ x 5½″ x 1¼″, rabbetted 1⅜″.
4 Head jambs, 2′ 8″ x 4½″ x 1¼″, rabbetted 1⅜″.
38 Plinth blocks, 9½″ x 4¾″ x 1″.
60 Corner blocks, 4¾″ x 1″.
3 Doors, closets, 2′ 4″ x 6″ x 1¾″, four panels, square edge.
1 Door, stairs, 2′ 2″ x 6′ 6″ x 1⅜″, four panels, square edge.
5 Doors, 2′ 6″ x 6′ 6″ x 1⅜″, four panels, square edge.
2 Boards, 12′ 0″ x 11¾″ x ⅞″, closet shelves.
4 Boards, 12′ 0″ x 4¾″ x ⅞″, closet cleats.
20 Base boards, 12′ 0″ x 6¾″ x ⅞″.
20 Base moulds, 12′ 0″ x 1¾″ x ⅞″.
22 Stops, 5′ 2″ x 2½″ x ½″.
1 Head stop, 4′ 0″ x 2½″ x ½″.
10 Head stops, 2′ 10″ x 2½″ x ½″.
800′ to lay No. 1 T. & G. spruce boards not over 5″ wide.
119 Pieces 3′ 6″ x 6″ x 1¾″, cut to pattern.
15 Boards 12′ long x 6″ x ⅞″.
1 Frame and border light, sash 30″ x 15″, jambs 6½″, attic.
4 Cellar storm sash, three lights, 10″ x 18″, 1¼″ thick.
2 Cellar storm sash, four lights, 10″ x 18″, 1¼″ thick.
8 Storm sash, four lights, 14″ x 30″, 1¼″ thick, with ventilators.
1 Storm sash, two lights, 18″ x 24″, 1¼″ thick, with ventilators.
1 Storm sash, four lights, 22″ x 30″, 1¼″ thick, with ventilators.
2 Storm sash, two lights, 14″ x 36″, 1¼″ thick, with ventilators.
8 Storm sash, four lights, 14″ x 28″, 1¼″ thick, with ventilators.
1 Storm sash, four lights, 20″ x 28″, 1¼″ thick, with ventilators.
1 Storm sash, four lights, 18″ x 28″, 1¼″ thick, with ventilators.
1 Storm sash, one light, 30″ x 24″, 1¼″ thick, with ventilators.
1 Storm door, 2′ 10″ x 6′ 10″ x 1¼″.
2 Door casings, 5′ 6″ x 4½″ x ⅞″.
1 Door head casing, 2′ 6″ x 4½″ x ⅞″.
6 Jambs, vestibules, 3′ 0″ x 5½″ x ⅞″.
1 Bottom jamb or sill, 7′ 0″ x 7¼″ x ⅞″, round edge.
4 Casings, 3′ 0″ x 4½″ x ⅞″.
4 Head casings, 3′ 0″ x 4½″ x ⅞″.
2 Surbases, 6′ 6″ x 3¾″ x ⅞″.
22 Plinth blocks, 10½″ x 4¾″ x 4¾″ x 1″.
43 Corner blocks, 0 4¾″ x 4¾″ x 1″.
1 Mantle shelf, 6′ 0″ x 8½″ x 4¼″, square ends.
18 Window stops, 5′ 6″ x 2⅝″ x ½″.
6 Head window stops, 3′ 0″ x 2⅝″ x ½″.
1 Head window stop, 4′ 0″ x 2⅝″ x ½″.
12 Window stops, 3′ 0″ x 2″ x ½″.
4 Door side lights stop, 7′ 0″ x 2½″ x ½″.
2 Door side lights head stop, 2′ 0″ x 2½″ x ½″.
2 Sash, 30″ x 24″, 1⅜″ thick, ash, D.D. glass.
1 Seat with one pew end.
1 Set stairs, ash.
1 Box seat with one pew end.
1 Seat in window landing.
12 Base boards, ash, 12′ 0″ x 5¾″ x ⅞″.
12 Pieces base mould, 12′ 0″ x 1¾″ x ⅞″.
14 Pieces picture mould, 12′ 0″ x 1¾″ x ⅞″.
8 Book shelves, 2′ 9″ x 10″ x ⅞″.
1 Vestibule door, ash, 3′ 0″ x 7′ 0″ x 1¾″, half glass, D.D.
1 Closet door, ash, 2′ 4″ x 5′ 6″ x 1¾″, four panels, M. 2 S.
6 Frames and sash, 28″ x 30″, two lights, 1⅜″ jambs, 6½″, weighted.
1 Frame and sash, 18″ x 24″, two lights, 1⅜″ jambs, 6½″ weighted.
1 Frame and sash, 44″ x 48″ transom, 48″ x 12″ leaded sash, 1¾″.
2 Frames and sash, 28″ x 36″ transom, 28″ x 12″ leaded sash, 1⅜″.
Casings, 8″ wide.
1 Exterior door and frame, 2′ 10″ x 6′ 10″ x 1¾″ No. 1 pine, ½″.
Glass D.D. jambs, 5⅝″.
1 Exterior door and frame, 3′ x 7′; side lights, 14″ glass; British plate in door, 1¾″ thick, clear pine.
1 Top and bottom rail, 1′ 0″ x 3¾″ x 1¾″.
1 Top and bottom rail, 8′ 0″ x 3¾″ x 1¾″.
2 Top and bottom rails, 10′ 0″ x 3¾″ x 1¾″.
1 Top and bottom rail, 12′ 0″ x 3¾″ x 1¾″.
156 Balusters, 1¾″ x 1¾″ x 20″.
2 Pieces piazza freize, 10′ 0″ x 8″ x ⅞″.
1 Piece piazza freize, 12′ 0″ x 8″ x ⅞″.
2 Pieces piazza freize, 8′ 0″ x 8″ x ⅞″.
2 Pieces piazza freize, 10′ 0″ x 6″ x ⅞″.
1 Piece piazza freize, 12′ 0″ x 6″ x ⅞″.
2 Pieces piazza freize, 8′ 0″ x 6″ x ⅞″.
1 Board for piazza, 12′ 0″ x 6″ x ⅞″.
200′ ⅝″ x ⅞″ Scotia.
1 Board rear porch, 12′ 0″ x 8″ x ⅞″.
1 Board rear porch, 12′ 0″ x 6″ x ⅞″.
400′ to lay 1¼″ T. & G. spruce, 5″ wide.
425′ to lay ⅝″ T. & G. spruce, V joint.
5 Treads, 8′ 0″ x 12″ x 1¼″, round one edge.
6 Risers, 8′ 0″ x 7½″ x ⅞″.
5 Treads, 4′ 0″ x 12″ x 1¼″, round one edge.
6 Risers, 4′ 0″ x 7½″ x ⅞″.
1 Piazza post, 6″ square, 8′ 0″ long.
350 Piazza lattice, 4′ 0″ x 1½″ x ⅜″, planed three sides.
16 Window casings, ash, 5′ 6″ x 4½″ x ⅞″.
1 Mull window casing, ash, 5′ 6″ x 5¾″ x ⅞″.
6 Head window casing, ash, 3′ 0″ x 4½″ x ⅞″.
1 Head window casing, ash, 4′ 2″ x 4½″ x ⅞″.
6 Stool caps, rabetted, ash, 4′ 0″ x 4½″ x ⅞″.

WOODEN SHINGLES A CONFLAGRATION HAZARD.

In the May issue of the Cement Age the need of fireproof roofs in residence construction was urged. So long as wooden shingles are used for roofs the conflagration hazard will hang over every town and village. They are conflagration breeders, being usually dry and inflammable, ready to be ignited by the first flying brand or spark. Insurance companies make very material reductions in rates for non-combustible roofs, and the old-fashioned slate, tin or gravel roofs and the newer cement-shingle and tile roofs should be encouraged by every municipality. So far as exposure fires are concerned, the one feature of the building which most needs protection is the roof, as flying brands or sparks are not likely to lodge anywhere else. Lighter forms of tile are now being produced, cement and asbestos shingles are growing in favor, and while their first cost is greater than wooden shingles, their much greater permanency and the immunity from fire danger and the reduction in insurance cost should encourage their more general use.

WATERPROOF COATINGS HAVE "MADE GOOD."

In reply to a correspondent, Concrete declares that many of the commercial waterproof coatings and stains on the market have a double purpose, preventing the absorption of water, with the accompanying weather stains, and decorating the concrete surface as paint does wood surfaces. In this case, also, concrete is not made to appear weaker than other masonry materials. Brick and stone are painted.

It seems to us unwise to condemn waterproofing materials as a class. In hundreds of instances commercial waterproofing methods are essential and they make good. They add many times their cost to the value of the structure. There have undoubtedly been placed upon the market worthless preparations that have not lived up to the claims made for them. These products have had their day and have gone. There remain dozens of reliable preparations which in many cases are indispensable and in others are used merely as precautions, which do their work well.

FABLE FOR BUILDERS.

Last Summer a Good Citizen of a certain town not over a hundred miles from almost Everywhere, built a Wooden house for a Woman and her Children. He built the Chimney of Brick because he had to. The Chimney was able to stand alone, so he did not have to prop it with Wood. But the Floors of the House would not stay up without props. The Good Citizen saved a dollar by using the Chimney as a support to the floors. He nestled the ends of the Floor Joists nicely in the brick of the Chimney. He covered up the job and got his money.

The Rains fell and the Winds blew and Winter came after its fashion. The Chimney settled a little, and there was a tiny Crack.

One morning the Woman woke up with fire all about her. She tried to get to her children. If she got to them no one ever knew it. The Good Citizen who built the house was not arrested for manslaughter. He is building other houses of the same kind for other women and children.

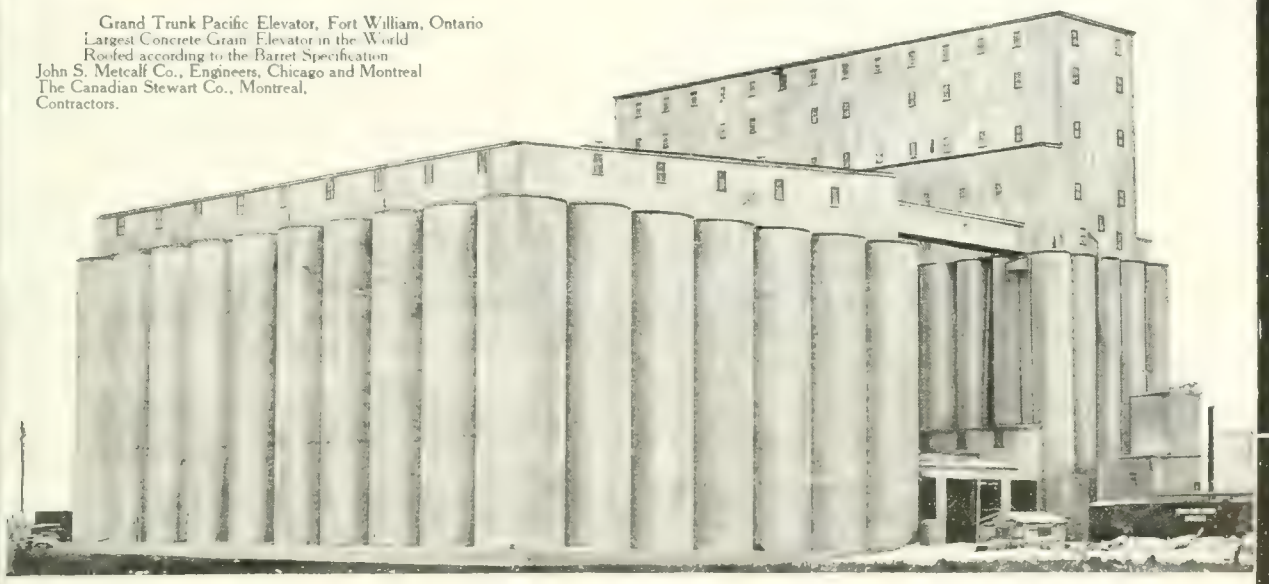
He is making his Living by it.—Franklin H. Wentworth.

RECORD FOR CONCRETE CONSTRUCTION.

Something like a record for speed of concrete construction has been established in the erection of the Manufacturers' Building in Vancouver, B.C. The structure was put up from the water's edge to a height of 103 feet in 118 days. There are about 14,500 square feet of floor area per floor, and the floors are designed to carry a live load of 175 pounds per square foot, the concrete slabs being carried on shallow concrete beams and girders, which, in turn, are carried by hexagonal columns, heavily reinforced to cut down their sizes to a minimum. The entire floors were finished as the work progressed from floor to floor, and were immediately covered with lake sand, to protect them from being marred. The building piers rest on clusters of piles. The largest columns in the basement are 28-inch hexagons, and the smallest, in the upper storey, are 10 inches square.

A Display of Ready Roofing by H. S. Howland Sons & Co.

Barrett Specification Roofs



Grand Trunk Pacific Elevator, Fort William, Ontario
Largest Concrete Grain Elevator in the World
Roofed according to the Barret Specification
John S. Metcalf Co., Engineers, Chicago and Montreal
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Largest Concrete Grain Elevator in the World

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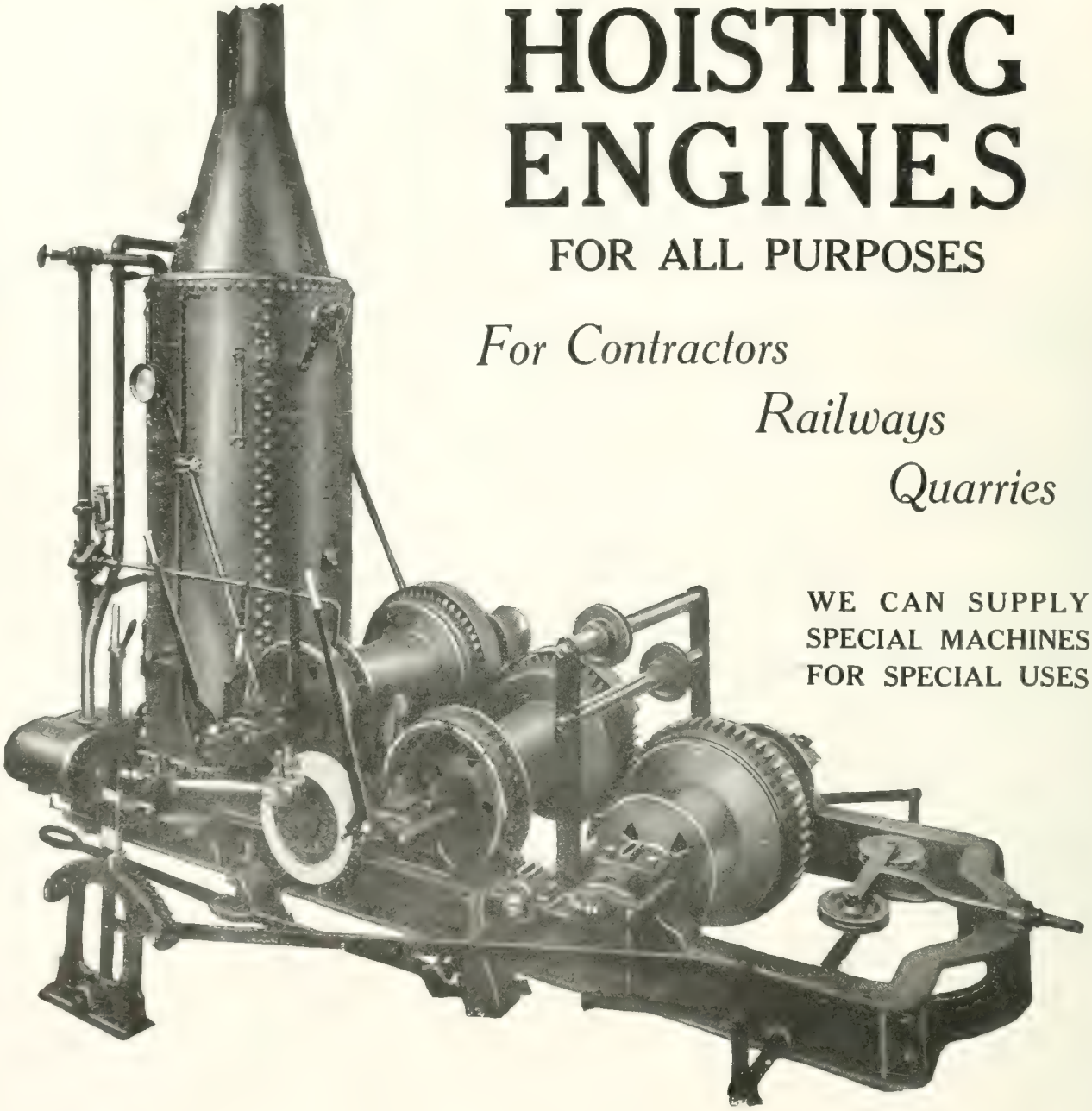

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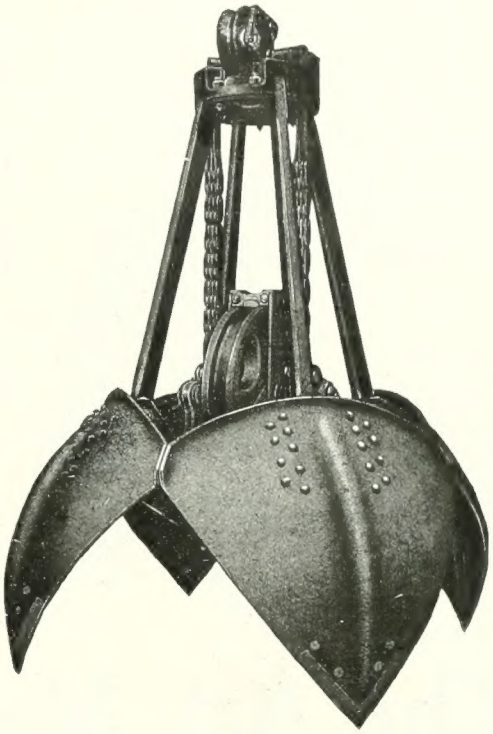

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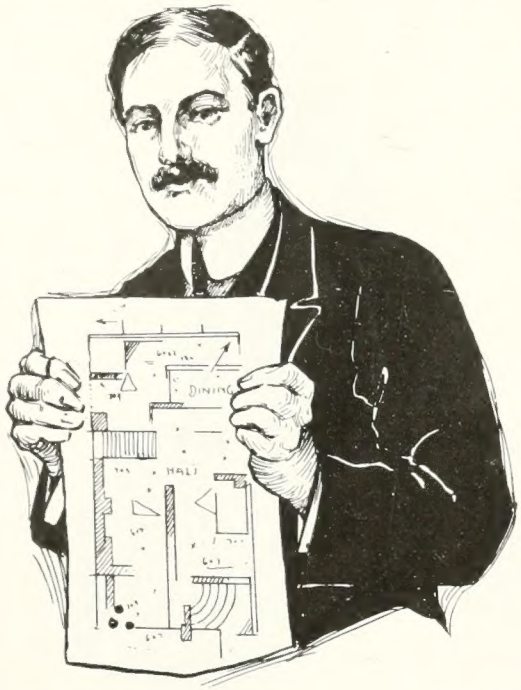

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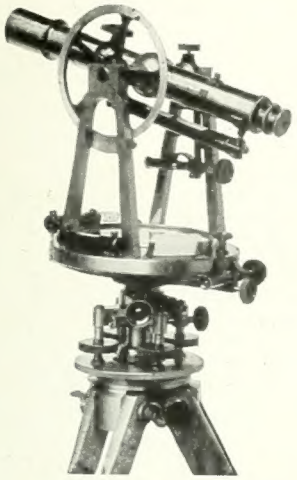

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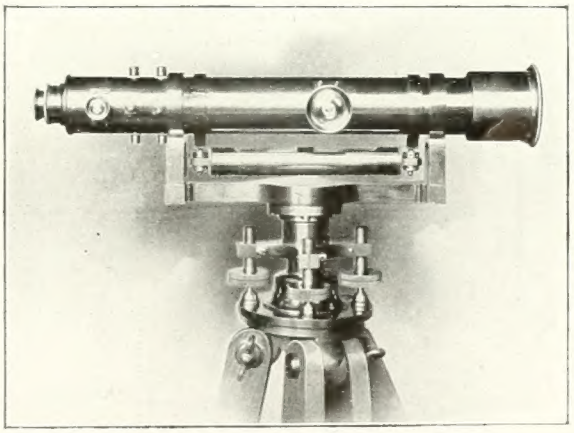

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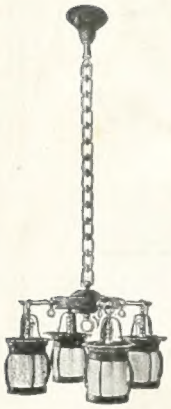

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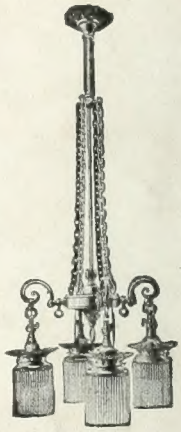

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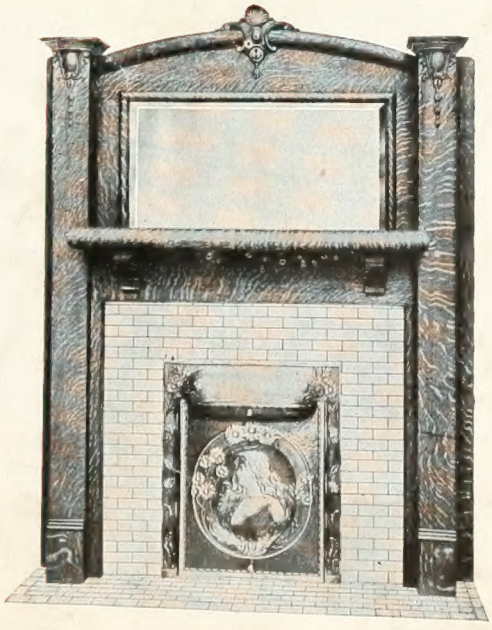

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